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BY ERNEST E. MADDOX, M.B.

ELECTRICITY IN THE TREATMENT OF UTERINE TUMORS
BY THOMAS KEITH, M.D., LL.D., EDIN. AND SKENE KEITH, F.R.C.S., EDIN.

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BY ERNEST HART

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By Ernest E. Maddox, M.B.

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THE

CLINICAL USE OF PRISMS;

AND THE

DECENTRING OF LENSES.

BY

ERNEST E. MADDOX, M.B.,

Late Syme Surgical Fellow, Edinburgh.

IX—18

THE CLINICAL USE OF PRISMS,

AND THE DECENTRING OF LENSES.

CHAPTER I.

The title of this little work indicates its chief features, but does not cover its ground completely. Its first object was to communicate a series of aids to precision in the use of prisms, worked out during several years, which it is hoped will be of some service in this difficult by-way of ophthalmic practice. They have, however, been introduced by a sketch of the simplest properties of prisms, and supplemented by a brief account of their chief clinical uses. For the sake of brevity, results are given rather than the geometrical processes by which they were obtained, while the mathematical formulæ are either suppressed or incidentally alluded to. When possible, home-made appliances are suggested in preference to expensive apparatus. Some failure in prescribing prismatic spectacles and combinations has perhaps arisen, in the past, from the lack of precise methods and tables to work by; encouraging exceptions must stimulate the desire to extend their number, but it will not be supposed that the precision aimed at in these pages is necessary in the majority of refraction cases. It is chiefly anomalies of convergence, faulty tendencies of the ocular muscles, and the needs of the increasing neurasthenic class of patients that are kept in view. In these last cases, spectacles cause discomfort, however perfectly refraction may be corrected, unless the lenses are also suitably placed in respect of convergence, and sometimes even then, for a time.

PRISMS.

A.—Simplest Properties of Prisms.

1.—*Geometrical Properties.*

In ophthalmology, as in optics, the essential thought of a "prism" is a wedge of transparent material, having at least two plane faces parted by an angle.

This angle may be of any size, and is spoken of as the "angle of refraction."

In Fig. 1 we see the prominent features of a rectangular prism—the kind most commonly used by students of optics.

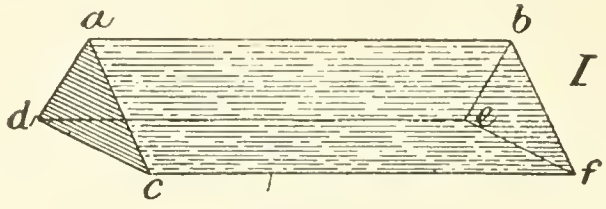

Fig. 1.—A Rectangular Prism.

The "refracting angle" is *d a c*; the plane faces, *a b d e* and *a b c f* are named "refracting surfaces," and the line *a b* in which they meet, or would meet if prolonged, is called the "edge."

The sections *a d c* and *b e f* being made in planes perpendicular to the refracting surfaces, are named "principal sections." The remaining surface *d c e f* is the "base."

When prisms are designated "square," "rectangular,"

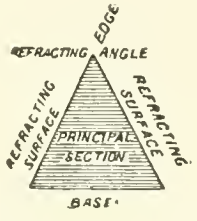

Fig. 2.—The same Prism in Section

"circular," and so forth, it is of course understood that these expressions do not, as indeed they could not, apply to the angle of the wedge, but to the scope of the two refracting surfaces. Clinical prisms are almost universally circular to admit of their insertion in the same trial frame as the lenses: the de-

sign in Fig. 3 shows how a circular prism is related to, as though it were cut out of, a rectangular one.

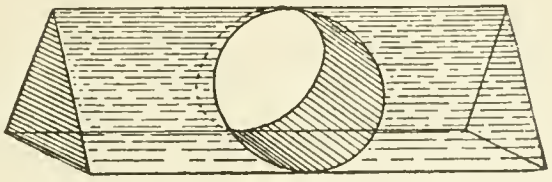

Fig. 3.—A Hypothetical Illustration to show the Relation of a Circular Prism to a Rectangular one.

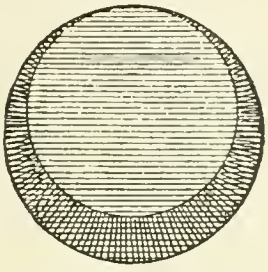

Fig. 4.—A Circular Prism.

2.—*Optical Properties of Prisms.*

When rays of light traverse a prism they undergo "refraction," by which they are bent from their previous course and emerge in a new direction. In Fig. 5 this is illustrated. An "incident ray" (*e*) is seen to impinge on the face *A C*, but here in passing out of the less refracting medium—air—into the more refracting medium—glass—it is bent toward the

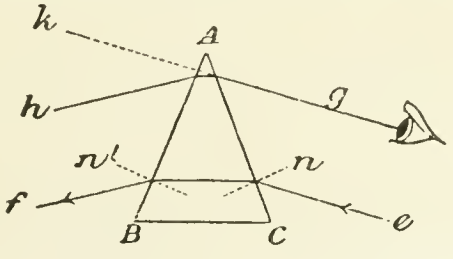

Fig. 5.—Refraction through a Prism. Incident ray, *e* ; emergent ray, *f* ; incident ray in opposite direction, *h* ; emergent ray, *g*.

dotted line *n*, which, being perpendicular to the surface, is called the "normal."

The ray, after traversing the prism, emerges from the other face *A B*, but since, while doing this, it is now again entering the less refracting medium, it is bent away from the normal, *n'*. The ray thus experiences a double deflection, the combined effect of which is that it is turned from its previous

course through an angle about half that by which the refracting surfaces are separated. It is important to notice that since the deflections take place only at the surfaces, the thickness of the prism, or the distance from its edge at which it is traversed by the ray, does not affect the result, provided the angle between the surfaces remains unchanged. Thus in the figure, the rays *g h* and *e f* are equally deflected, though the former is much nearer the edge of the prism than the latter: the greater the angle (*B A C*) between the faces, the greater is the deflection of both rays. (For the index of refraction, the law of sines, etc., the reader is referred to the text-books. Their study is not essential for our subject.)

Minimum Deviation.—When the points of incidence and emergence of a given ray are equi-distant from the edge of the prism, as in the figure, the ray is said to traverse the prism in the "direction of minimum deviation;" or, to put it another way, the prism is said to be (in reference to the ray) in its "position of minimum deviation." By this it is meant that the ray under these conditions suffers less total deviation than if it passed through the prism in any other direction. (This is beautifully defined, in an experimental way, by Deschanel: "When a beam of sunlight in a dark room is transmitted through a prism, it will be found, on rotating the prism about its axis, that there is a certain mean position which gives smaller deviation of the transmitted light than positions on either side of it: and that when the prism is in this position, a small rotation of it has no sensible effect on the amount of deviation. The position determined experimentally by these conditions, and known as the position of minimum deviation, is the position in which the ray passes symmetrically.") With weak prisms, however, and only slight departures from the "position of symmetry," the difference is so trifling that it may be neglected in ophthalmic practice.

Dispersion.—By dispersion, or "chromatic aberration," is meant the breaking up of light into its constituent colors. It is a property possessed in greater or less degree by all prisms, since the differently colored rays, being unequally refrangible, are deflected through different angles, the violet rays (or more correctly the lavender, if they are really part of the spectrum) experiencing the greatest deflection, and the red the least, while the paths of the rays of intermediate colors are spread

out between these two extremes. The whole solar spectrum can thus be received upon a white screen arranged to intercept a pencil of light which has traversed a strong prism. This property of dispersion, so valuable in spectrum analysis, and to which also are due the various tints of dawn and sunset, is a serious disadvantage in the ophthalmological use of prisms, from the colored margins it appears to give to objects, and the want of definition it occasions, just in proportion to the strength of the prism used.

It is only fairly weak prisms, therefore, that can be clinically employed with much advantage. The dispersive power of crown glass is so much less than of flint glass that it is invariably employed for clinical purposes. Achromatic prisms can be made by cementing together two prisms, one of crown, the other of flint glass, with the apex of one to the base of the other, since the ratio between the refractive and dispersive power is different in the two kinds of glass. (The dispersive power of crown glass is to that of flint glass as 33 to 52; whereas the refractive power is about as 31 to 32, though it varies greatly with different specimens, and must be determined for each.) But though suggested long ago, such combinations have been precluded by their weight from clinical use.

3.—*Clinical Properties of Prisms.*

The only clinical use of prisms is to change the direction of the rays of light, but this is fruitful in its secondary applications. They always produce an optical illusion; in other words, they make objects appear in a different position from that which they actually occupy.

Clinical prisms, as we have seen, are generally circular; their thinnest point is called the "apex" and their thickest part the "base."

An imaginary line between the apex and base is called, for convenience, the "base-apex line." All objects viewed through a prism appear displaced in a direction parallel to this line, and always toward the edge, by which is meant the line in which the two plane surfaces would, if prolonged, meet. It is customary to say that objects appear displaced toward the apex, an expression which, if a little less correct, is still very convenient, provided it is not misunderstood. The accompany-

ing diagram (Fig. 6) will make it clear, and a glance back to Fig. 3 may assist in understanding what is meant by the "edge," for since the refracting surfaces of the rectangular prism are extensions of those of the circular one (supposing the latter to be in place) the line in which they meet is the "edge," of both prisms. Thus, to give an experimental exam-

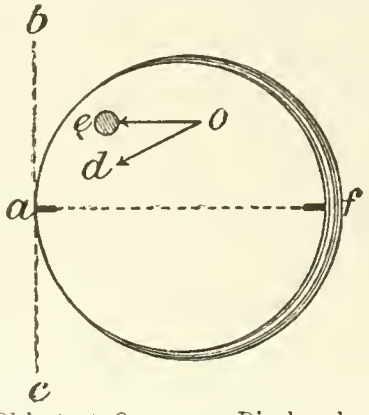

Fig. 6.—To show how an Object at *O* appears Displaced, not in the Direction *d* toward the Apex *a*, but in the Direction *e* toward the Edge *b c*, and Parallel to the "Base-apex Line," *a f*

ple, if we look at a vertical line on the wall, as *x x* in Fig. 7, through a prism held several inches from the eye, with its apex at *a*, we observe that the part of the line seen through the prism appears displaced toward its edge. The reason is apparent from a glance at Fig. 5 (on p. 269), where the ray *h g* from an object at *h* is deflected by the prism toward its base,

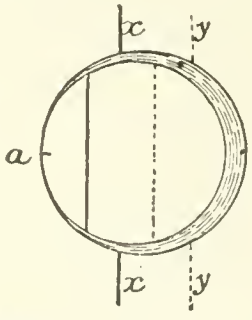

Fig. 7.—To show the Apparent Displacement of Lines through a Prism.

so that it appears to come from *k*; or, in other words, it enters the eye in a direction as if it came from *k*, so that the object is mentally projected there. Since the refracting surfaces of any prism are of necessity inclined to each other by the same angle in every part of their area, it follows that the apparent displacement of an object is equally great, through whatever part of the prism it is viewed. Thus in Fig. 7 the lines *x x*

and *y y* appear equally displaced. By this property prisms may be at once distinguished from lenses, or combinations of lenses and prisms. With a lens, lines viewed through different sides of its optical centre appear displaced in opposite directions; with a concave lens, both lines appear deflected toward the centre, and with a convex one both away from it. As regards direction of displacement, the edge of a convex lens is well known to act like a prism with its edge outward, while that of a concave lens acts like a prism with its edge inward, though in each case the degree of displacement increases with each approach from the centre to the edge. By viewing a distant line through an unknown lens, hard by its edge, and opposing to it lens after lens from the trial case

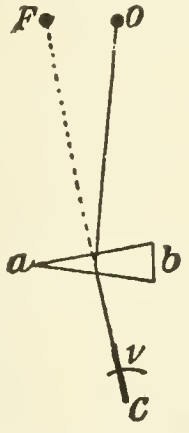

FIG. 8.—A Prism before an Eye, in Monocular Vision.

till the line appears unbroken, the strength of the unknown lens can be determined to within a quarter of a dioptre, and the same principle is utilized in the now general practice of viewing some object through a moving lens, to observe whether the apparent movement of the object is with or contrary to that of the lens, which in the former event is concave, and in the latter convex.

To return to prisms, we have seen that they appear to displace objects in the direction of their edge. Since an eye tends to be diverted toward the (apparently) new position of the object, it follows that the line of fixation is also displaced toward the edge, and in working with prisms these two clinical properties are all that need be remembered. Fig. 8 illustrates both: a prism is placed before one eye, the other being covered, and it is evident that the object *O* appears displaced

to *F*, and the line of fixation *v* is diverted from *O* to *F*—both in the direction of the apex *a*. The line *F C* in which the false image lies is called the "line of projection," since it marks the direction in which the picture on the retina is mentally projected.

With binocular vision, as in Figs. 9 to 12, the conditions are not quite so simple. In all these figures the ruled lines show the actual course of the rays from the object *O*, and the dotted lines are the lines of projection. They almost explain themselves: in all it will be seen that the object appears displaced toward the edge of the prism, though in some (Figs. 9 and 10) there is diplopia, since the object is seen in its true

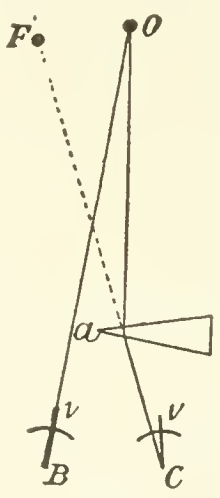

Fig. 9.

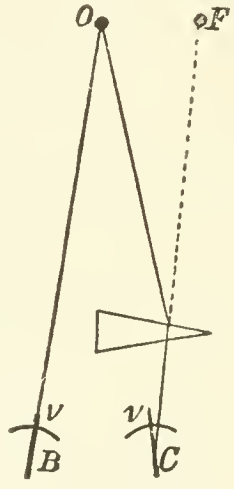

Fig. 10.

Figs. 9 and 10.—Prisms not Overcome, and therefore Causing Diplopia.

position *O* by the unclad eye at the same time that its false image *F* is seen by the other in the direction of the edge of the prism, which is directed inward in Fig. 9, and outward in Fig. 10. In Figs. 11 and 12 there is no diplopia; it has been corrected by the desire for single vision, and the two images are fused into one. Still, the united image appears in a false position, though the angular displacement of the line of projection *p p*, is only half that in the previous examples. The diplopia is corrected by a rotation of the eye so as to receive again upon its fovea centralis the picture of the object which the prism had dislodged to another part of the retina; thus in these two figures the line of fixation *v C*, has come to be in line with the rays of light coming through the prism from the object, and since both eyes receive a picture on the fovea,

vision is single. In Figs. 9 and 10 there is no definite line of fixation for the right eye, since it is fixing nothing, and it is clear that the picture must fall on the retina away from the fovea, though with every effort to unite the images and bring the axis of vision v C, into the line of the rays, the position of the picture on the retina will vary, and the images will move toward or from each other.

Prisms set with their edge inward as in Figs. 8, 9, and 11, are called adducting prisms, and those with their edge outward as in Figs. 10 and 12, are called abducting prisms. The

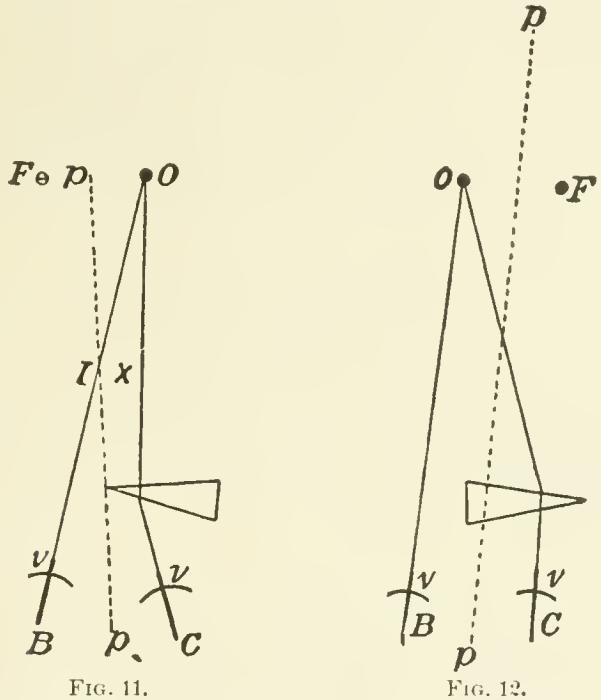

Fig. 11. Fig. 12.

Figs. 11 and 12.—Prisms Overcome; no Diplopia.

former, when vision is binocular and without diplopia, by increasing the necessary convergence of the eyes, make objects appear nearer than they actually are, and the latter make them appear too far away. Thus in Fig. 11 the real object *O*, appears to be at *I*, where the two lines of fixation intersect. (Exceptions to this I have pointed out in "Journal of Anat. and Phys.," vol. 21, p. 21, but it is not desirable to enlarge on it here, or to enter deeply into the physiology of convergence, which would need a book to itself.) As Hering has shown, convergence occurs as if for the cross and both eyes are turned toward *I* by an impulse of the conjugate innervation which turns the two eyes to the left: it is the mental cogni-

zance of this effort which imparts corresponding obliquity to the line of projection, *p p*. The prism, therefore, does not test the strength of either rectus, since convergence is a single action affecting both eyes equally, but it estimates by how much convergence can be made to exceed accommodation, or *vice versa*. The two functions are so confederate that there are limits to the amount by which either can be increased or diminished without the other. Prisms should be placed as close as possible to the eye, then their angles of deviation nearly express the diplopia, or corrective squint, they occasion, or the sum of both if both are present.

One of three events therefore may happen on placing a prism before an eye. (1) If vision is monocular, one false image is seen, whose distance from the actual position of the object is unvarying, and dependent entirely on the deviating angle of the prism, Fig. 8. (2) With binocular vision the prism may be too strong to be overcome, in which case there is diplopia with an inconstant distance between the images, which approach each other spasmodically with every effort to overcome the prism. (3) The diplopia may be overcome and the object appear single, though its position in space is misjudged through an angle practically equivalent to half the deviating angle of the prism.

B.—Marking the Apex.

Circular prisms, as usually sold, have their apex and base indicated by a slight scratch from a diamond. It is to be feared, as we shall see, that experimental work with prisms has hitherto been frequently vitiated by the prevalent inaccuracy in marking the apex—a defect to which, as far as I am aware, no attention has yet been called. An obvious consequence of inaccurate marking is that prisms may not be quite squarely set in the trial-frame; yet the slightest departure from precision in this particular alters the experiment. For example, if it be desired to set a prism of 15° d, with its edge exactly in or out, an aberration of the base-apex line through only a ninetieth part of a circle has the effect of not only lessening in a trifling degree the desired horizontal deflection which it is the aim of the prism to produce, but also of introducing a new and unsuspected vertical deflection of more

than 1°. This is shown in Fig. 13, where the actual flame *o*, appears displaced to *a* instead of *b*—the true base-apex line being *o a*, though the prism is marked as if it were *o b*; hence *a o b* is the angle of error in setting the prism. At twelve feet distant the flame would appear more than two and a half inches higher than it really is. (The unsuspected vertical deflection of a ray of light by a prism whose base-apex line is supposed to be horizontal, or the unsuspected horizontal deflection by a prism whose base-apex line is supposed to be vertical, may be found in any particular case, by the following formula, sin. x = sin. D + sin. r; where x is the angle required, D is the deviating angle of the prism, and r the angle of accidental rotation from exact rectitude.) Now it is well known that vertical diplopia greatly embarrasses the neuromotor apparatus, and in some persons it cannot be overcome at all

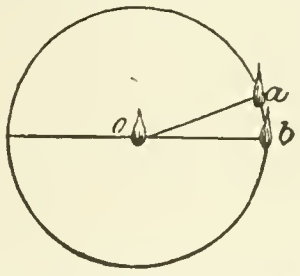

Fig. 13.—Showing the Effect of Setting a Prism by a Wrong Mark. The marked apex is toward *b*, and the true apex is toward *a*, so that the flame *o*, which should appear at *b*, appears at *a*.

when greater than one degree, so the prism in the previous experiment may be put down with the verdict that it is too strong to be overcome, when really it is the concomitant accidental vertical diplopia created by it which cannot be overcome, or at least the effect of which vitiates the experiment.

If any surgeon will take the trouble to test the marks upon his own prisms he will find how frequently they are misplaced; the test can be easily made by the following simple device. Draw upon a sheet of paper two fine straight lines intersecting each other exactly at right angles as in Fig. 14, and hold the prism vertically above them so that on closing one eye the supposed apex apparently coincides with the point of intersection of the lines, and the prism only appears to touch the horizontal line at that point, and does not in the least overlap it on either side. If the prism is correctly marked, the vertical line appears unbroken as in Fig. 14, but if not, the part of the line seen through the prism appears disjointed from

the rest, and displaced as in Fig. 15, toward the side of the real apex. It only remains to rotate the prism till the unbroken appearance of Fig. 14 is gained; then the point on the prism's edge in apparent coincidence with the point of intersection of the lines may be regarded with confidence as the real apex. The cross-lines can be permanently provided on a large card suspended upon the wall of the consulting-room in connection with that for testing the deviating angle, and they will be found useful for many purposes. For opticians it is suggested to have a diamond half imbedded in a plate of glass fixed horizontally above cross-lines similar to those already employed, or merely above one vertical line if the horizontal one be graven on the glass. The diamond would be brought in correspondence with the point of intersection of

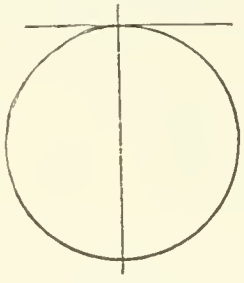

Fig. 14.

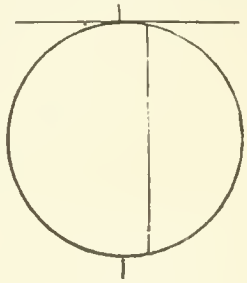

Fig. 15.

Fig. 14.—Mode described for Testing the Apex of a Prism.
Fig. 15.—Appearance with a Badly-marked Prism.

the lines, so that after finding the apex a slight push of the prism would mark its true position.

A still better form of the apparatus would be one with two shoulders cemented on the glass plate, to grip the edges of the prism instead of using a horizontal line, and to have the diamond held in a sliding arm to make a perfectly straight scratch. Greater distance of the prism from the vertical line magnifies the phenomenon, and makes the test more delicate. The true base of a prism can be found and marked in just the same way as the apex, and if prisms thus manufactured come into use, one of the many causes of experimental inaccuracy will be removed.

C.—Prismetry.

The name prismetry will be given to the measurement of the deviating angle of prisms; that of goniometry being already applied to the measurement of their physical angles.

For measuring the refracting angle of a prism (that is, it will be remembered, the angle by which its refracting surfaces are parted), several instruments exist already, named goniometers, of which it is easy to make an adaptation suitable for ophthalmological prisms. [A home-made goniometer for clinical prisms can be easily made by mounting a prism-holder (a lens-holder will do) by a pivot on the centre of a small circular dial of wood; a long-hand of a clock is fixed to the upright pivot of the prism-holder, and the dial is graduated with degrees, or simply fitted with a common protractor as found in any box of mathematical instruments. The procedure is as follows: Place the prism to be tested in the holder, with base-apex line horizontal, and support the whole instrument on a table or stand opposite the window. Now set the indicating clock-hand at zero of the scale, and rotate the dial itself till a vertical sash of the window, as seen reflected from one face of the prism, appears (to an eye placed between the prism and the window, but lower than the former) exactly to coincide with a chosen spot or line on the opposite wall. Now leave the dial *in statu quo*, but rotate the clock-hand till the same window-sash is seen reflected from the other face of the prism, and is brought in line as before with the other two points. The index-hand will now be found pointing to the degree on the scale which describes the refracting angle. The only precaution necessary is to be sure that the observer's eye occupies the same position in making the two observations. Another way to measure the refracting angle is to adapt the legs of a pair of compasses to the two faces of the prism, then either use a protractor, or measure the distance between the points of the legs, by placing them on a millimetre rule. If the length of the legs is known, the angle required is found by dividing the length of the legs by half the distance between their points, and doubling the angle of which this is the sine. But the dial mode first described, or that with the protractor, needs no calculation. Having thus, by one or other way, measured the refracting angle A, we may measure the deviating angle D, by one of the modes given in the text, and then ascertain the refractive index of the glass of which the prism is composed by dividing the sine of half the sum of the two angles by the sine of half the refracting angle.

$$\text{Thus:} \quad \mu = \frac{\sin. \frac{A + D}{2}}{\sin. \frac{A}{2}} \Big]$$

But these acquaint us only with the geometrical—not with the optical—properties of prisms; what the surgeon needs alone to know is not their refracting angle, but their deviating power over a beam of light. It has been noticed already that this "angle of deviation" is in each case about half the angle of refraction—with weak prisms rather less, and with strong ones rather more, than half (Donders)—but apart from this difference, and from the uncertainty of always in practice insuring the exact position of minimum deviation, the refractive index of different specimens of crown glass varies so much

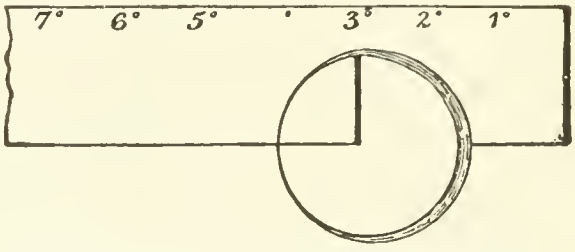

Fig. 16.—The Author's First Mode of Prismetry.

that, as Donders ("Accommodation and Refraction of the Eye," Sydenham Society, p. 132) truly observed of the angles of deviation: "If we wish to know these accurately, it is necessary to determine the deviations for each glass separately." To do this with certainty and ease two simple methods were contrived some years ago, one most suitable for the student or surgeon, the other for the optician. The first can be made without expense, and employed without artificial light. It consists simply of a strip of cardboard suspended horizontally near the right-hand corner of a consulting-room wall, and at such a height from the floor as to be about level with the eyes of the observer. On the wall adjacent to that on which the cardboard is hung, and which enters into its right-hand corner, a permanent mark is made at the distance most generally convenient for making the observations. The card itself is marked, as in Fig. 16, in degrees (really, of course, in tangents of degrees. A paper scale of this kind was affixed in May, 1886, to the wall of Messrs. Pickard and Curry's work-

shop, having been sent them by the author for measuring the deviating angles of their prisms) for this distance. All that is necessary to measure the deviating power of a prism is to hold it opposite the already mentioned mark on the wall (the distance of the observer's eye behind the prism does not affect the result in any way) with its apex to the left, and so that its upper border appears just beneath the line of degrees as in the figure. The vertical border of the card appears necessarily displaced toward the edge, and points upward to the number which expresses in degrees, at once and without calculation, the required deflecting angle of the prism. In the figure this is seen to be 3°. One precaution alone needs to be observed; if the lower edge of the cardboard seen through the prism appears disjointed from the level of the rest, as in Fig.

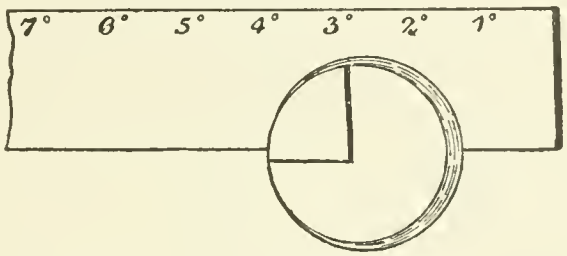

Fig. 17.—A Prism Not Held Truly.

17, the apex of the prism is not pointing exactly to the left, but is either too high or too low, according as that part of the broken line seen through the prism is above or below the remainder. A slight rotation is therefore necessary to correct this, till the lower border of the cardboard appears at one level, as in Fig. 16.

The distances between the degrees of the card depend, of course, on the chosen distance at which it is found most convenient to hold the prism, and this would depend on the size of the room and other conditions. The distance of the observer's eye from the prism is of no consequecne; any student can easily mark a piece of cardboard for himself from the accompanying table, which gives the distances from the right-hand border of the card at which the several degrees are to be marked upon it, assuming the prism to be held at a uniform distance of six feet (first column), or two metres (second column).

TABLE I.

For marking a card in tangents of degrees at 6 ft. (column A); or 2 metres (column B).

	A	B		A	B
1°	1.25 in.	3.49 cm.	9°	11.4 in.	31.29 cm.
2°	2.5 "	6.98 "	10°	12.6 "	34.73 "
3°	3.7 "	10.467 "	11°	14.0 "	38.16 "
4°	5.0 "	13.95 "	12°	15.3 "	41.58 "
5°	6.3 "	17.43 "	13°	16.6 "	44.99 "
6°	7.57 "	20.9 "	14°	17.9 "	48.38 "
7°	8.84 "	24.37 "	15°	19.3 "	51.76 "
8°	10.12 "	27.83 "	16°	20.64 "	55.13 "

For a different range, the measurements would of course differ in proportion; thus, should it be decided to always hold the prism at three feet, the distances would be half as great

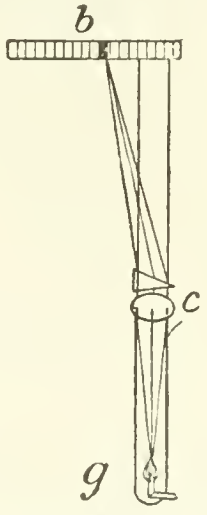

Fig. 18.—Second Mode of Prismetry.

as in the table; if at twelve feet, twice as great. It is clearly an advantage, when a patient enters with prismatic spectacles, for the surgeon to be able to ascertain their strength without calculation or artificial light; and such spectacles will no doubt come into more frequent use, since convergence is becoming more precisely studied.

The second method affords a much prettier demonstration of the deviating angle of prisms, but needs a more definite illumination than diffused daylight. It consists of a strip of wood, as in Fig. 18, laid flat on a table or counter with a shorter strip *b*, fixed at right angles to its further end in such wise that while horizontal in its length its plane is vertical. Upon the longer strip a cylindrical lens *c*, is fixed erect, with its axis vertical, so as to throw a line of light from the gas

flame *g* upon the strip *b*, which is marked in degrees (strictly speaking, "in tangents of degrees"), so that a prism held before the cylinder *c*, with its base-apex line horizontal, at once makes the bright line move to that degree which indicates the deviating angle. The flame can either be fixed to the main strip or be quite separate, and it is well, if the light is poor, to combine with the cylindrical lens a spherical one of such strength that the source of light shall be at its principal focus. [A modification in this method was suggested by Messrs. Pickard and Curry (to whom it was given about the same time as the other), viz., to curve the graduated scale into an arc, in order to save the calculation of tangents in its manufacture. The following foot-note appeared in an essay at the time: "Since the only clinical use of prisms is to deflect the rays of light which traverse them, and since the index of refraction varies with the different specimens of glass, the usual method of marking prisms is not very satisfactory for exact purposes. After consultation with Messrs. Pickard and Curry, they have now a quick method of testing the declinating angle of their prisms" ("Journal of Anatomy and Phys.," Maddox, October, 1886, p. 32). It will be seen, however, from this extract, that it was only for "exact" (*i.e.*, physiological and experimental) purposes that the need was thus expressed for the marking of prisms with their deviating angles. Dr. Jackson's subsequent proposal has prominence given to it in the text, because it embraces all prisms used in ophthalmology: its acceptance by Messrs. Pickard and Curry was due to the energy of Dr. Landolt, last year.]

An important proposal has been made by Dr. Edward Jackson, of Philadelphia, that all ophthalmological prisms should be marked with the angle by which they deviate rays of light, and, in consequence, it was recommended by a committee of the American Ophthalmological Society in September of the year 1888, that—

(1) Prisms ought to be designated by the number of degrees, "minimum deviation," they produce.

(2) Where intervals of less than one degree are desired, half degrees and quarter degrees should be used.

(3) To indicate that degrees of deviation are meant, the letter *d* should be used; thus prism 2°*d* will indicate a prism that produces a minimum of two degrees.

The committee consisted of Drs. E. Jackson, S. M. Burnett, and H. D. Noyes, and their decision was conveyed by Dr. Landolt to the Heidelberg Congress in the same year.

It is almost certain, therefore, that prisms thus marked will soon come into general use, and they will greatly simplify calculation.

Possibly, however, if I may be allowed to suggest it, a still better plan would be to have all prisms marked with metre angles and their fractions, so as to correspond with lenses in the trial case, a metre angle being the chosen unit of convergence just as a dioptre is that of accommodation. The only disadvantage is that the metre angle is an inconstant quantity. It is the angle by which each eye has converged from direct parallelism while fixing a point in the median line at the distance of one metre. Its size, therefore, depends on the distance of the centre of rotation of the eye from the median plane, for it is this line which subtends the angle. Its average in adults is taken by Nagel as 1° 50′. It is useful to have a scale, as in Fig. 16, marked in metre angles according to this average, as well as a scale marked in degrees, so that by holding any prism up to view, its strength in either unit can be seen without calculation.

In Table II. the measurements are given by which such a scale can be made by any one for himself, on a strip of paper or cardboard.

TABLE II.

For marking a card to be used at the distance of two metres, for telling the strength of a prism in metre angles.

Metre Angles.		Metre Angles.	
0.5	3.2 cm.	5.0	32.3 cm.
1.0	6.4 "	5.5	35.6 "
1.5	9.6 "	6.0	38.9 "
2.0	12.8 "	6.5	42.2 "
2.5	16.0 "	7.0	45.6 "
3.0	19.3 "	7.5	49.0 "
3.5	22.5 "	8.0	52.3 "
4.0	25.7 "	8.5	55.8 "
4.5	29.0 "	9.0	59.3 "

D.—Planeness of Surface.

Little need be said of this, though in buying prisms it is well to examine the planeness of the important "refracting surfaces;" it is often very defective, and this slightly contrib-

utes to the difficulties of using prisms. Moreover, since plane faces are rarely ground with the same accuracy as spherical ones, it is better when combinations of lenses and prisms are prescribed to have both surfaces spherical instead of one spherical and the other plane, except when very strong lenses are employed, in which case they are better sometimes plano-convex to diminish spherical aberration.

E.—Adjustment of Prisms in the Trial-frame.

If the apex and base of a circular prism are correctly marked, there is no difficulty in setting it with the base-apex line either exactly vertical or horizontal. But if there should be any doubt about their precise position, the following simple expedient will at once enable us to detect and correct any

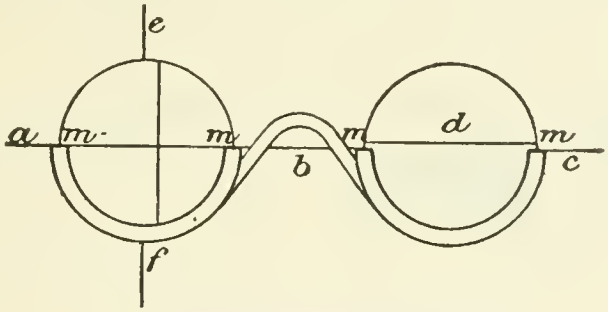

Fig. 19.—Two Prisms in a Trial-frame.

malposition. If the base-apex line is wished to be horizontal as with the right-hand prism of Fig. 19, hold the trial-frame a few inches from the eyes, so that, as represented in the figure, the upper extremities *m m m m*, of its sockets coincide to all appearance with a horizontal line *a b c*, upon the wall: if this line upon the wall appears continuous, the prism is correctly set, but if that part of it visible through the prism appears disjointed from the rest as *d* in Fig. 19, the apex is either too high or too low, according as the apparent disjointment is upward or downward. In the figure the apex is too high and the correction is therefore easily made by rotating the prism so as to depress the apex till the line appears continuous. If the base-apex line is wished to be vertical, as with the left-hand prism of the same figure, the horizontal line on the wall must be supplemented by another at right angles to it, as *e f* in the figure: again adjusting the frame as before to the horizontal line of sight, the rectitude of the prism is now indicated

by the appearance of the vertical line. If its course appears undeviating the setting is faultless, but if, as in the figure, the part seen through the prism is dissociated from the rest, the apex is shown to be too much to the same side, and it therefore needs readjustment.

F.—Temporary Trials.

Before prescribing prisms or their combinations, it is well, when practicable, to let the patient wear a trial pair at home for a few evenings first, for sustained action alone affords a true indication of whether they will suit. Prisms and lenses can be bound in an ordinary trial-frame by a strip of gutta-percha, but as accidental rotation is very apt to occur, some other contrivance is desirable when prisms alone are in question. Fig. 20 represents a device I once suggested (I find since that Mr. Chas. Wray, F.R.C.S., of Croydon, has had a some-

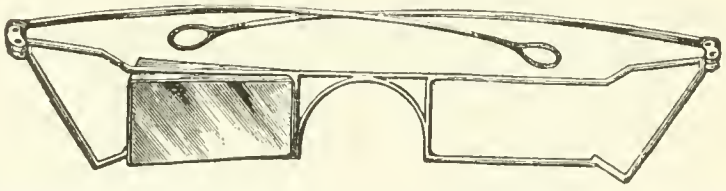

Fig. 20.—Rectangular Prisms in a Frame, as suggested in the text. This frame may be obtained from Messrs. Pickard and Curry.

what similar frame made with the addition of a spirit-level. Dr. Stevens says: "It is my custom to keep on hand a large number of spectacle-frames of uniform size, and a quantity of plain prism glasses of 1°, 2°, and 3°, which can be, without loss of time, slipped into the frames. With these I am able, in a few moments, to arrange temporary prisms for a patient."—"Archives of Oph.," June, 1888, p. 184) for the purpose of holding rectangular prisms, which I find can be made quite as cheaply as circular ones. The small size of the prisms, while yet allowing sufficient lateral range of movement for the eyeballs, would contribute to the manifest desideratum of lightness. No time is wasted in exact adjustment of the prisms, as their shape not only secures a correct position at once, but removes any possibility of subsequent displacement. Each prism has a longitudinal groove in its upper and lower surface, so that it need only be pushed in between the wires till caught by the elbow.

So light a frame as this could be worn, together with an ordinary pair of spectacles, when it is desired to try for a few evenings the joint effect of prismatic and spherical glasses.

These prisms would also be exceedingly useful for those cases of paralytic strabismus in which partial or complete recovery may be expected, and for which prismatic spectacles are prescribed. The necessity, if this treatment of such cases is to be successful, of prescribing weaker prisms as the case improves (for without this they actually retard recovery), makes it desirable to have a set of test prisms, a pair of which can be worn for a few days or weeks, and be exchanged for another pair if they cause discomfort, or when they need to be weakened owing to progressive recovery.

CHAPTER II.

DECENTRING OF LENSES; AND COMBINATIONS OF PRISMS WITH LENSES.

INSTEAD of combining a prism and a lens, where it is wished to obtain the effect of both, it is very frequently possible to get the same result by simply decentring the lens, a process which, though already well known, may be simply explained.

The "optical centre" of a lens is that point in it traversed by all rays which, after entering the lens, emerge from it in a direction parallel to their former course. (This one "property" is all that is necessary for our present purpose, hence it is mentioned, instead of giving a correct definition; see p. 289.) All rays which do not traverse the optical centre are bent from their former course to a degree which depends on the distance from this point, at which they pass through the lens—the greater the distance the greater the deflection. In other words, a lens, in every part other than the optical centre, has the effect of a prism upon any single ray of light—the effect of a weak prism near the optical centre, and of a stronger and yet stronger one with every further removal from it, and this equally with concave as with convex lenses. It is evident, therefore, that by shifting a lens so as to bring a more peripheral part into use, a prismatic effect can be obtained just as much as if a prism had been cemented to the lens in its former unshifted position. Such displacement of the optical centre can be effected in one of two ways, the prismatic equivalent of which is identical, but each of which possesses an advantage of its own. First, the lens may simply be displaced as it is, rim and all, by lengthening or shortening the spectacle-frame; or, secondly, the frame remaining unchanged, the lens can be decentred, in its rim as shown in Fig. 21. The dioptric strength, or refraction-correcting power, of this lens is exactly the same as that shown in Fig. 22, inasmuch as their surfaces have the same radius of curvature, but it is as though it were

cut peripherally, as shown in Fig. 23, from a larger lens *c d*, so that its optical *O*, and geometrical *G*, centres do not coincide as in an ordinary lens. A brief study of Fig. 21, which gives the lens *a b*, of Fig. 23 in section, will show that the effect of cutting it eccentrically out of a larger lens is exactly the same as if a smaller lens of the same strength had been split to admit a prism between its two halves. Without altering its dioptric power, then, a prism has been virtually introduced. The geometrical centre of a lens is the point midway between all edges, as *G* in Figs. 21, 22, and 23. The optical centre, on the other hand, lies between all points (strictly, of course, points cannot be parallel, but only the tangents to the curve at the points. But the text will be easily understood)

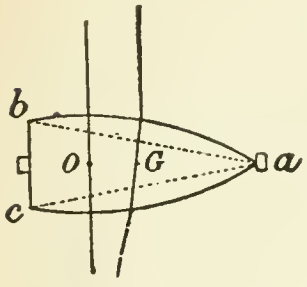

Fig. 21.

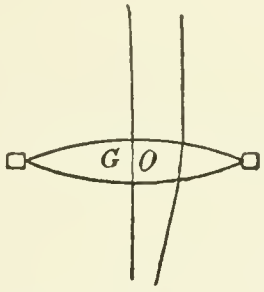

Fig. 22.

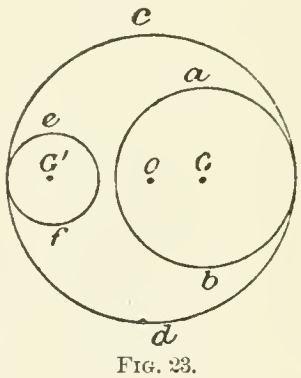

Fig. 23.

Fig. 21.—A Decentred Lens.
Fig. 22.—A Lens Normally Centred.
Fig. 23.—Peripheric Lenses Cut Out of a Larger One.

on the two opposite surfaces of a lens which are parallel to each other and which therefore have no more prismatic or deviating effect on a ray of light entering by one and emerging by the other than a plate of glass would have. It is needless to say that it lies in the thickest part of a convex lens and the thinnest part of a concave one. (It lies in the principal axis of a lens—the line joining the two centres of curvature; and divides the line of centres in the ratio of the radii of curvature.) For determining its position in any particular lens, an apparatus will be described further on. A lens is said to be normally centred when the optical and geometrical centres coincide as in Fig. 22; but to be decentred when, as in Fig. 21, the optical centre *O*, and the geometrical centre *G*, are apart, the amount of decentration depending on their distance apart. The two points may be so far removed from each other that

the optical centre may come to lie outside the lens altogether. Such would evidently be the case with the small lens *e f* in Fig. 23, since the optical centre is at *O*. Fig. 24 shows this small lens in section, and it is evident at a glance that opposite surfaces are nowhere parallel, and that one or both of the surfaces would need to be prolonged considerably before any point could be found in the one parallel to a point in the other; were this done a line uniting the points would pass through the optical centre *O*. We have seen that the effect of decentring a biconvex lens is equivalent to splitting it into two halves, and inserting a prism between them (*b a c* in Fig. 21).

Fig. 24.—A Lens with its Optical Centre, *O*, far Outside Itself.

The strength of this virtually interpolated prism depends on, first, the amount of decentration, and, second, the dioptric strength of the lens. A strong lens needs decentring to a less extent than a weak one to produce the same effect. Table III. not only illustrates this, but enables us to find the exact prismatic effect of decentring any lens. All that is required is to fix on the number of millimetres (in the highest horizontal row of figures) by which a lens is known to be decentred, and the prismatic effect is found in the column beneath, opposite the dioptric strength of the lens. Conversely, should it be required to know how much to decentre a given lens in order to combine with it the effect of a certain prism, the eye runs along the horizontal line of angles opposite the known strength of lens till that angle is found nearest to the strength of prism required, when the number of millimetres at the head of the column will indicate the decentring necessary.

The word "decentring" is generally applied to the removal of the optical centre away from the geometrical centre of the lens, but we have already said that the prismatic effect is the same if the whole lens, rim and all, be simply displaced, as by lengthening or shortening the spectacle-frame; in other words, it makes no prismatic difference, so long as the optical centre is moved, whether the geometrical one remains *in statu quo*, or whether it is shifted equally itself. How are we then to decide between these rival modes, in any given case? De-

TABLE III.

	1 mm.	2 mm.	3 mm.	4 mm.	5 mm.	6 mm.	7 mm.	8 mm.	9 mm.	10 mm.	11 mm.	12 mm.	13 mm.	14 mm.	15 mm.	16 mm.	18 mm.	20 mm.	22 mm.	24 mm.	26 mm.	28 mm.	30 mm.	32 mm.
·5D	1′ 43″	3′ 26″	5′	7′	8′ 25″	10′	12′	14′	15′28″	17′	19′	20′37″	22′27″	24′	26′	27′30″	31′	35′	38′	41′	45′	48′	52′	55′
·75D	2′ 30″	5′	8′	10′	13′	15′28″	18′	20′37″	23′	26′	28′	31′	33′	36′	38′	41′	46′	52′	57′	1° 2′	1° 6′	1° 12′	1° 17′	1° 22′
1D	3′ 26″	7′	10′	14′	17′	20′37″	24′	27′30″	31′	35′	38′	41′	45′	48′	52′	55′	1° 2′	1° 9′	1° 16′	1° 23′	1° 29′	1° 36′	1° 43′	1° 50′
1·5D	5′	10′	15′28″	20′37″	26′	31′	36′	41′	46′	52′	57′	1° 2′	1° 6′	1° 12′	1° 17′	1° 22′	1° 32′	1° 43′	1° 53′	2° 3′	2° 13′	2° 24′	2° 34′	2° 44′
2D	7′	14′	20′37″	27′30″	35′	41′	48′	55′	1° 2′	1° 9′	1° 16′	1° 23′	1° 29′	1° 36′	1° 43′	1° 50′	2° 4′	2° 18′	2° 32′	2° 46′	2°58′	3° 12′	3° 26′	3° 40′
3D	10′	15′28″	31′	41′	52′	1° 2′	1° 12′	1° 22′	1° 32′	1° 43′	1° 53′	2° 3′	2° 13′	2° 24′	2° 34′	2° 44′	3° 6′	3° 26′	3° 46′	4° 7′	4° 27′	4° 48′	5° 9′	5° 29′
4D	14′	27′30″	41′	55′	1° 10′	1° 22′	1° 36′	1° 50′	2° 4′	2° 18′	2° 32′	2° 46′	2° 58′	3° 12′	3° 26′	3° 40′	4° 8′	4° 35′	5° 2′	5° 29′	5° 56′	6° 24′	6° 50′	7° 18′
5D	17′	35′	52′	1° 9′	1° 26′	1° 43′	2°	2° 18′	2° 35′	2° 52′	3° 9′	3° 26′	3° 43′	4° 1′	4° 17′	4° 35′	5° 9′	5° 44′	6° 17′	6° 51′	7° 24′	7° 58′	8° 32′	9° 6′
6D	20′37″	41′	1° 2′	1° 23′	1° 43′	2° 4′	2° 24′	2° 45′	3° 5′	3° 26′	3° 46′	4° 7′	4° 27′	4° 48′	5° 9′	5° 29′	6° 10′	6° 51′	7° 31′	8° 12′	8° 52′	9° 32′	10° 12′	10° 52′
7D	24′	48′	1° 12′	1° 36′	2°	2° 24′	2° 48′	3° 12′	3° 37′	4° 1′	4° 24′	4° 48′	5° 12′	5° 36′	6°	6° 24′	7° 11′	7° 58′	8° 45′	9° 32′	10° 19′	11° 5′	11° 52′	12° 38′
8D	28′	56′	1° 22′	1° 50′	2° 18′	2° 46′	3° 12′	3° 40′	4° 8′	4° 35′	5° 2′	5° 29′	5° 56′	6° 21′	6° 50′	7° 18′	8° 12′	9° 6′	9° 59′	10° 52′	11° 45′	12° 38′	13° 30′	14° 22′
9D	31′	1° 2′	1° 32′	2° 4′	2° 35′	3° 6′	3° 37′	4° 8′	4° 38′	5° 9′	5° 39′	6° 10′	6° 40′	7° 11′	7° 41′	8° 12′	9° 12′	10° 12′	11° 12′	12° 11′	13° 10′	14° 9′	15° 7′	16° 4′
10D	35′	1° 9′	1° 43′	2° 18′	2° 52′	3° 26′	4° 1′	4° 35′	5° 9′	5° 44′	6° 17′	6° 51′	7° 24′	7° 58′	8° 32′	9° 6′	10° 12′	11° 19′	12° 25′	13° 30′	14° 34′	15° 39′	16° 42′	17° 45′
12D	41′	1° 23′	2° 4′	2° 45′	3° 26′	4° 7′	4° 48′	5° 29′	6° 10′	6° 51′	7° 31′	8° 12′	8° 52′	9° 32′	10° 12′	10° 52′	12° 11′	13° 30′	14° 47′	16° 4′	17° 20′	18° 34′	19° 48′	21°
14D	48′	1° 36′	2° 24′	3° 12′	4° 1′	4° 48′	5° 36′	6° 24′	7° 11′	7° 58′	8° 45′	9° 32′	10° 19′	11° 5′	11° 52′	12° 38′	14° 9′	15° 39′	17° 7′	18° 34′	20°	21° 24′	22° 47′	24° 8′
16D	56′	1° 50′	2° 46′	3° 40′	4° 35′	5° 29′	6° 23′	7° 19′	8° 12′	9° 6′	9° 59′	10° 52′	11° 45′	12° 38′	13° 30′	14° 22′	16° 4′	17° 45′	19° 24′	21°	22° 7′	24° 8′	25° 38′	27° 7′
18D	1° 2′	2° 4′	3° 6′	4° 8′	5° 9′	6° 10′	7° 11′	8° 12′	9° 12′	16° 12′	11° 12′	12° 11′	13° 10′	14° 9′	15° 7′	16° 4′	17° 57′	19° 48′	21° 36′	23° 22′	25° 5′	26° 45′	28° 22′	29° 57′
20D	1° 9′	2° 18′	3° 26′	4° 35′	5° 44′	6° 51′	7° 58′	9° 6′	10° 12′	11° 19′	12° 25′	13° 30′	14° 34′	15° 39′	16° 42′	17° 45′	19° 48′	21° 48′	23° 45′	25° 38′	27° 29′	29° 15′	30° 58′	32° 37′

TABLE III. – Showing the prismatic effect of decentring any lens. *Procedure.*—Find the dioptric strength of the lens in the left-hand column, the prismatic effect is then found opposite, under the number of mm. of decentring. [This table is adapted from a thesis in 1881, where it appeared under another title ("Journal of Anat. and Phys.," Vol. XXI., p. 32). It was made from the simple formula: Tan $x = \frac{d}{f}$; x, being the deviating angle of the virtual prism; d, the decentring in millimetres; f, the focal length of the lens in millimetres.]

centring of any kind has the disadvantage of being attended with proportionate increase of weight, as much as if a prism were inserted: the lens of Fig. 21 is very evidently heavier than that of Fig. 22. This fault is entirely avoided by the alternative of displacing the entire lens (instead of only decentring the optical centre in the lens), but, on the other hand, such displacing entails, beyond certain limits, a limitation of the field of binocular fixation. It may therefore be laid down as a practical rule that the dislocation of the optical centre should be effected by displacing the whole lens, rim and all, as much as can be done without interfering with the field of binocular fixation (*i.e.*, the range of lateral binocular vision), leaving only the remainder (should any more be required) to be obtained by decentration proper, that is by decentring the lens in its rim.

To take an example, let us suppose it is desired to prescribe spectacles such that each optical centre is 10 mm. nearer to the middle line than the centre of the eye, and we have found by the localizer that the centre of each eye is 32 mm. from the median (sagittal) plane. The effect of limitation of the field of binocular fixation must be considered for each case, for its inconvenience or otherwise depends on the distance of the patient's occupation; but say that, on consideration, 5 mm. of displacing for each lens is all that is advisable; that will make each geometrical centre 27 mm. from the middle line, and leave 5 mm. for decentring.

In prescribing the spectacles, therefore, some such form as the following would be used. To make such a pair of lenses

	R.	L.
Spherical.....	+ 4 D	+ 4 D
Cylindrical.....		
Geometrical centre.. ...	27 mm.	27 mm.
Decentration.....5 mm. inward.		5 mm. inward.

the optician might first make two larger lenses of + 4 dioptres, and 10 mm. (*i.e.*, twice the decentration) wider than the lenses required, which would then be cut out peripherically as in Fig. 23. But this would involve a serious waste of time and labor, since precisely the same result may be attained by the simpler plan of finding from Table III. the prismatic equivalent of the decentring, and then proceeding as he is accustomed to do when ordered to combine a prism of that deviat-

ing power with a lens. He would cut the prism required, and then impart to its surfaces the required sphericity. Lest any confusion should arise here between the deviating and refracting angles, it will be well to repeat that the angle of refraction by which the two surfaces of a prism are separated, and by which the workman first cuts a prism, is twice the angle of deviation which is given in the table, and marked on the prismeters. In the example we have taken, in which lenses of + 4 D are decentred 5 mm., a reference to Table III. shows that the prismatic equivalent is 1° 10′, but this being the deviating angle must be doubled to get the angle of refraction, which will therefore be 2° 20′. Two prisms, each with their plane surfaces at an angle of 2° 20′, will now be made, and a sphericity of + 4 D be given to each surface. Having thus shaped the decentred lenses, the workman would next place them in a frame made with the centre of each rim 27 mm. from the middle of the bridge. The effect of such a pair of spectacles on a patient with the centre of each pupil 32 mm. distant from the middle line, would be the same as if normal lenses of + 4 dioptres, each combined with a prism of 2° 18′d, were placed exactly in front of the two eyes, as may be easily seen from the table; for 5 mm. of decentring + 5 mm. (*i.e.*, 32—27) of displacing give a total of 10 mm. for the alteration in position of the optical centre. Under the heading of 10 mm. in the table, opposite 4 D, is found the combined prismatic effect, viz., 2° 18′. With this, of course, the optician has nothing to do.

Though it was thought well in passing to give an instance of how a decentred lens may be prescribed, a better plan will be to mention, not the decentring, but the prism equivalent to it. This will save the optician all calculation, with the attendant possibility of a mistake.

It will be a simple proceeding for the surgeon, after finding the total prismatic effect it is desirable to produce, to deduct from it the proportion to be attained by displacing, and set down the rest in the form of a prism whose surfaces are to receive the needed sphericity. To take a varied illustration, we will suppose the lenses to be sphero-cylindrical. If the axis be vertical, the effect of a cylinder on convergence is precisely the same as that of a spherical lens of the same curvature, but with each departure from the vertical it acts like a

weaker spherical lens till with axis horizontal its effect is *nil.* A lens, therefore, of + 3 D sph., + 2 D cyl., axis vertical, would affect convergence like a + 5 D sph.: with axis horizontal it would affect convergence like a + 3 D sph. Let us take for an example such lenses of + 3 D sph. and + 2 D cyl., axis vertical, the total effect on convergence being that of a spherical lens of + 5 D. Suppose it is wished to relieve the convergence of each eye by 2° for an occupation distance of 15 inches. It is decided, let us suppose, that 7 mm. of displacing can be allowed without interfering with the required field of fixation. But 2 mm. out of these 7 mm. must be deducted as useless for the purpose, since they only go to counteract the excess of convergence, which lenses placed precisely in front of the centres of the eyes would occasion in near vision, for it is clear that the lines of fixation would then traverse the lenses internal to their optical centres. With habitual vision for 15 inches, we have to allow 2 mm. for this reason, and with vision for 10 inches we have to allow 3 mm., since only if the lenses were 2 mm. or 3 mm. respectively, internal to the centre of the eyes, would they have no effect on convergence, for then only the visual axes would traverse the optical centres. This position therefore forms the zero, by departing from which in either direction the convergence is affected. To return to our example, after deducting these 2 mm., 5 mm. of effective displacing remain. By Table III. we find the prismatic equivalent of 5 mm. of displacing to be exactly 2°. This is all we desired, and there is therefore no need for decentring. Had it been desired to afford greater relief to convergence, say 4°, then the remaining 2° should be prescribed as prismatic combination. If the centre of each eye be 32 mm. from the middle line, then this, less the total 7 mm. of displacing, would make the geometrical centre 25 mm. from the middle of the bridge, and it would stand thus:

	R.	L.
Spherical	+ 3 D	+ 3 D
Cylindrical	+ 2 D axis vert.	+ 2 D axis vert.
Geometrical centre	25 mm.	25 mm.
Prismatic	4° (2°d) edge out.	4° (2°d) edge out.

The optician should understand that the new marking is intended whenever the letter "d" is appended. In this case,

therefore, he would cut two prisms, each with an angle of refraction of 4°, and impart to one surface a sphericity of + 3 D, and to the other a cylindricity of + 2 D, setting them in a frame with the centre of each rim 25 mm. from the middle of the bridge.

To relieve convergence, prisms should be "edge out;" while convex lenses should be displaced inward, and concave lenses outward.

To meet excessive convergence, prisms should be "edge in;" convex lenses displaced outward (only slightly practicable, owing to limitation of near binocular fixation) and concave lenses inward. It is with strong lenses, such as those for aphakia and high myopia, that care in the position of the lenses is of chief importance.

"Orthoscopic spectacles," as described by Dr. Scheffler, have been so long known that they must not altogether escape mention. In these, accommodation and convergence are affected in equal amount. The two lenses have but one optical centre common to both, just as though they were cut from opposite edges of one large lens. The proof of their correct manufacture is that they throw a single distinct image of a flame upon a wall. They have generally been prescribed in a few standard strengths, but they can be made for any patient by combining with each of his lenses a prism whose deviating angle is found in Table III., opposite the description of lens and under the number of millimetres by which the optical centre of each eye is distant from the middle line. These spectacles undoubtedly may have their place, but it is better to ascertain the conditions of convergence in each case and prescribe accordingly, rather than to adhere to any fixed combinations.

CHAPTER III.

LOCALIZATION.

Localizing the Eyes.

It will be at once evident from the preceding section, that it is impossible to prescribe spectacles of any kind with a view to produce a definite prismatic effect without first knowing the precise distance of the centre of each eye from the middle line, and in clinical work the need must have been often felt for a quick yet reliable objective test. Many subjective tests are in existence already for the purpose of telling, not the distance of each from the middle line, but the mutual distance between the centres of the two eyes ("interocular" or "intercentral" distance); such as Smee's "visuometer" as used by Donders, Landolt's chiasmometer, Snellen's frame, or Dr. Johnstone's trial-frame with the short tubes in the two discs. But an objective test is more desirable, and especially one for each eye, and though it is true that single points have already been placed before each pupil, such as, for example, the intersection of cross-wires, with a view to obtain this information, yet the very principle of such a single "sight" or "bearing" is fallacious. It affords no guide or guarantee for the position of the observing eye, which is therefore left to guess-work. For a test to be true in principle, not only must the visual lines of the observing and observed eye coincide, but the line so composed must be exactly at right angles to the line uniting the centres of the two eyes, or at least if one eye be examined with any angle of inclination, the inclination must be the same in the examination of the other (on the principle of the parallelogram). It need hardly be said that this cannot be insured when only a single point is used for a bearing. To overcome this difficulty the writer has had a little device made (Fig. 25), with two sights so disposed as to always be in a line at right angles to any trial-frame in which it is placed. One pupil is localized at a time, all that is necessary being to in-

crease or diminish the breadth of the frame till the two sights and the centre of the pupil are in line as in Fig. 26; the patient meanwhile is bidden to be looking at the pupil of the surgeon's observing eye, by doing which the two visual lines (*i.e.*, that of the observing and that of the observed eye) come to practically coincide. If the patient is a child it is quite easy to

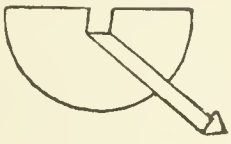

Fig. 25.

excite its interest in its own miniature reflection in the surgeon's pupil while taking the observation, adeptness in which needs a few trials to become familiar with the parallactic motion. The instrument is then placed in the other rim of the frame, and the observation repeated for the other eye.

By this method we comply with the two afore-named conditions of accuracy; the visual lines of the observing and observed eyes coincide, and of necessity they are both at right angles to the trial-frame. The frame must of course be one movable by a screw, and marked in millimetres, so that the record can be read off after localizing each pupil. The dis-

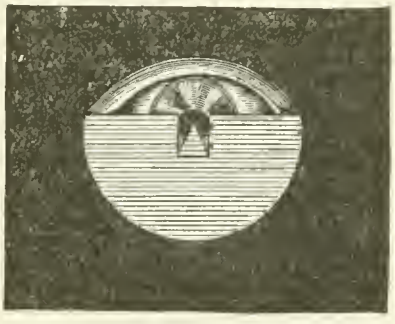

Fig. 26.

tance of the centre of each eye from the middle line is in each case half what is registered by the frame. It is true that the present methods are considered sufficiently exact for practical purposes, but there is, nevertheless, a pleasure in working on correct principles, and a number of small inaccuracies in the different steps of testing and prescribing may amount together to a considerable error. The frequent and careful use of this

principle will show how many an unsuspected difference exists in the position of the two eyes, and will train the surgeon who uses it to a quicker appreciation of a symmetry and its amount. When ordinary spectacles are prescribed for eyes placed unsymmetrically, the prismatic effect is greater for one than the other, which may (or may not) be deleterious, or even advantageous, according to the nature of each case, which, therefore, needs individual investigation.

CHAPTER IV.

ANALYSIS OF SPECTACLES.

So far we have dealt with the synthetical part of our subject, how to combine lenses and (virtual) prisms. The analytical part must now be considered. When a patient comes to us with a pair of spectacles already in use, but which cause discomfort, how are we to analyze their prismatic effect and find how the glasses are centred? One thing is clear, that we must set ourselves to discover with all possible accuracy the cause of the discomfort. It may be due to the irritability of the patient's nervous apparatus, but before deciding this we must exclude the other alternative, that the spectacles are not the best in every way that could be given. The focal length of the lenses is easily determined by the plans given on page 273. The next thing is to measure the distance between their optical centres, or, preferably, the distance of each from the centre of the bridge, and this may be done in several ways. If sunlight is procurable the spectacles may be held at their focal distance from a card exactly parallel to the two lenses; then the distance between corresponding points of the two spots of light on the card gives the required distance between the optical centres. If artificial light be used, the distance between the spots of light (more strictly, between corresponding points in them) must be multiplied by the distance of the light from the spectacles and divided by that of the light from the card. In this experiment care must be taken that the light and the bridge of the spectacles are in a line perpendicular to the lenses and the card. A modification of the phakometer could easily be adapted for this purpose. But inconvenience attaches to the use of either direct sunlight or artificial light, and if they can be dispensed with the better. Fig. 27 illustrates a rough mode of telling the distance between the optical centres. The spectacles are held horizontally, and some inches above a card marked to one side with a

vertical line x, and toward the other side with parallel lines y, at different measured distances from the single one. The observer, holding his left eye about a foot above, and as nearly vertically over the left lens as he can judge, closes the right eye, and moves the spectacle-frame from side to side till the line x appears unbroken by the left lens. Now, without moving the head, the right eye is opened and the left closed, and that line which appears to be least displaced by the right lens is the line nearest its optical centre, and the number above it furnishes a rough estimate of the required distance between the two optical centres. To ascertain whether each optical centre is midway between the upper and lower border of its

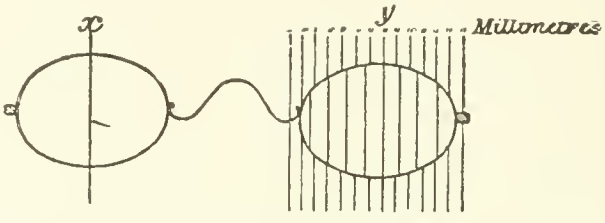

Fig. 27.—A Simple Way of Telling the Distance between Optical Centres of a Pair of Spectacles.

rim, each lens must be held lengthwise over the left-hand line till it appears to run continuously. The principle (though not new) of this test is so simple, yet its imperfections so many (besides its want of accuracy, it only gives the mutual distance between the optical centres, and not the distance of each from the middle of the bridge, and it is not available when the optical centre lies outside the lens), that I have constructed an "analyzer" to secure the former without the latter; it is shown in Fig. 28. The two essential conditions are that the lenses should be parallel to the card and that the line of vision in looking through each lens should be exactly vertical. The first is secured by laying the spectacles on the plate of glass $c\,d$, which is movable from side to side; and the second by keeping the eye so that the line x is maintained in apparent coincidence with the line $n\ p$. The letters $a\ b$ indicate the narrower strip, also movable, marked exactly across the middle with a transverse line x. On either side of the slides is a millimetre scale with the zero in the centre. The broad slide has a long line w right across it, opposite the zero of its scale. The card $r\ s$ has only one line upon it, exactly beneath the central lines of the glass strips, and it can be placed either in

the bottom of the apparatus, as in the figure, or in the grooves higher up, for lenses whose focal length is shorter than the height of the glass plates above the lowest grooves. The card is generally used in its lowest position, because distance of the line upon it from the lenses, as we have already seen with prisms, magnifies the phenomenon and makes the experiment more delicate. The height of the upper surface of the glass plates from the card in the lowest grooves is about four and one-half inches.

To analyze a pair of spectacles, lay the centre of the bridge

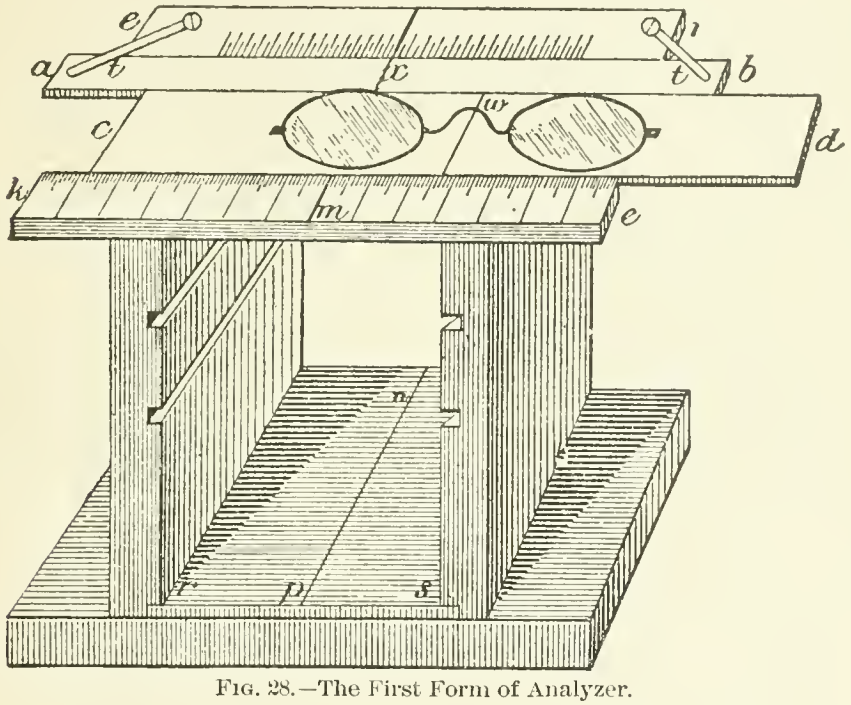

Fig. 28.—The First Form of Analyzer.

on the line *w*, and place the observing eye so that the lines *x* and *n p* appear to coincide. Now move the broad slide bearing the spectacles till the line *n p* appears undeviating through one lens; then *w* points to the distance between the optical centre of that lens and the centre of the bridge. Repeat in the same way for the other lens.

The geometrical measurements, as for the breadth of frame and the rims, are made by laying the spectacles still lengthwise, but half on the broad slide and half on the narrow. By keeping the line *x* at zero, and placing any required point of the spectacles over it, then drawing out the line *w* to the other point, the latter line indicates the required distance, on

the scale *k e*. It is well to have the narrow strip fixed by strong pieces of watch-spring *t t*, like those for microscope slides, or by a little screw at one corner of the frame.

Lastly, by laying the geometrical centre of a lens opposite the zero of the scale *k e*, the line *n p* will, if it be a decentred lens, appear displaced through it. How great is the apparent displacement? By answering this we tell the prismatic equivalent of the decentring without recourse to any table. We must use another sight (another way is to use a plane mirror instead of the card *r s* and keep the line *x* in line with its reflection—a little difficult sometimes) fixed to the narrow slide perpendicularly beneath its line *x*, then by holding the eye so as to keep them both in apparent coincidence (thus insuring a vertical line of vision) and moving them till they appear exactly abreast of the apparent displacement of the line *n p* as seen through the lens, the prismatic equivalent of the decentring is indicated by the degree on the scale *e f* to which *x* points. The special applicability of this mode is when the optical centre lies outside the lens. The principle would, of course, be the same if, instead of moving the glass slide, the analyzer were so made as to let the card at the foot be moved alongside a metric scale. When the lenses under test are of shorter focal distance than the height of the analyzer, the card must be placed in one of the other two pairs of grooves: then, though the use of the scale *k e* is unchanged, it must be remembered that when the card is in the grooves half-way up, each figure in the scale *e f* must be multiplied by two, and when the card is in the highest grooves, as for cataract lenses, each must be multiplied by four. (For the guidance of opticians, it may be said that the scale *e f* can be marked either in millimetres or in degrees; if the latter, then the height of the lenses above the card must be 53.3 mm. or some multiple of that number, for the degrees to be one millimetre from each other, or some multiple of a millimetre. But if marked in millimetres the height of the lenses above the card should be 100 mm., so that by a table of tangents affixed to the analyzer the degree can be found. This is the most exact method, especially for strongly prismatic lenses, but being rather less simple is not mentioned in the text.)

Another Form of Analyzer.—The instrument already described is, perhaps, most appropriate for surgeons, since no

artificial light is needed, and it is small and portable. For opticians, however, who use large numbers of spectacles and wish to classify them, another kind is recommended, which permits both the focal length and the position of the optical centres to be tested at one and the same time.

A plan of it is shown in Fig. 29. Upon a horizontal strip

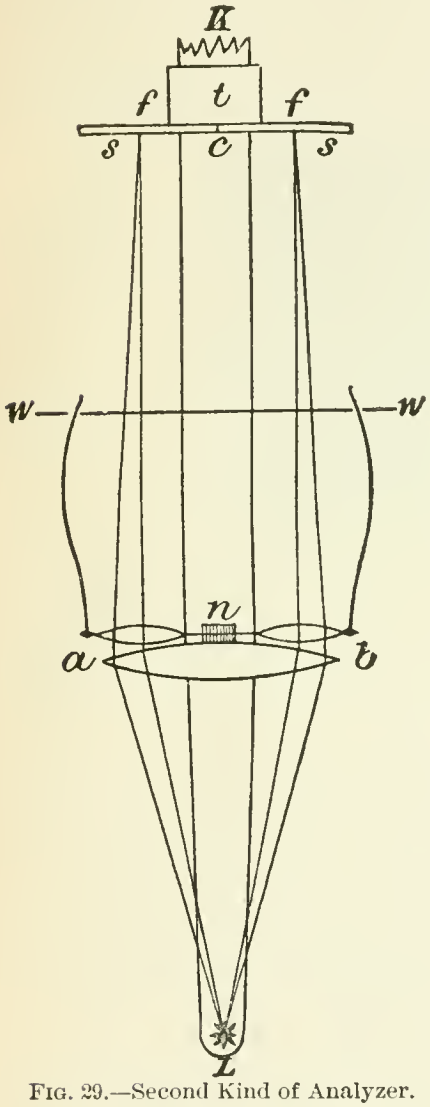

Fig. 29.—Second Kind of Analyzer.

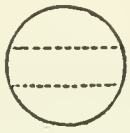

Fig. 30.—A Lens with the Equatorial Zone marked by Dotted Lines.

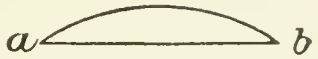

Fig. 31.—Plano-convex Lens.

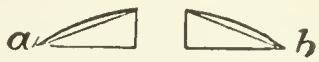

Fig. 32.—An Analyzer made with a Trial-frame.

of wood *k l* is fixed an equatorial portion of a large lens (preferably plano-convex, as in Fig. 31, to lessen spherical aberration). Fig. 30 represents in miniature how this rectangular piece is cut from the equatorial band or zone of the large lens: it should be as long as the broadest spectacles used. At its focal distance is placed a flame *L*, so that parallel rays of light are thrown upon a screen *s s*, which is fixed to the trav-

eller *t*, and is provided with a metric scale, running right and left from the central zero at *c*. A small wooden nose *n* is provided to support the bridge of the spectacles, and two wires *w w*, fixed to the under surface of the strip of wood, so as not to interfere with the movements of the traveller, support its limbs or temple-pieces. Two movable stenopæic slits (in default of which the large lens should be blackened except in two vertical stripes) greatly increase the definition of the focal points *f f*, which indicate upon the metric scale the distance of each optical centre from the middle of the bridge. After laying a pair of spectacles in position, the traveller is moved till distinct images are thrown on the screen; then the dioptric strength or focal length is read off from the flat strip which is marked both in dioptres and inches, and the position of the optical centres is read off from the screen. Fig. 32 is to show how a temporary style of the instrument can be made by placing in each side of a common adjustable trial-frame a lens in conjunction with a prism. (The lenses chosen should have a focal length equal to the most convenient distance of the flame; then, by Table II., prisms should be selected nearest to the strength indicated opposite the dioptric description of the lens in or near the columns headed by 28 mm. or 30 mm. After setting them in position with the apices of the prisms exactly outward, the final correction is made by adding to each couple a vertical stenopæic slit, and holding the whole combination exactly athwart direct sunlight, so as to throw two fine images upon a card held at the focal distance of the lenses. The trial-frame is then adjusted so that the two images exactly coincide. Their action now is the same as that of the large lens.) But rectangular reading-glasses can often be obtained in shops, and the portions not to be used can be covered with asphalt or with black silk plaster.

The Effect on Convergence of Displaced or Decentred Lenses.

This study will cause embarrassment if allowed in any way to be confused with those of previous pages, and perhaps, for that reason, the less said on it the better. It must be clearly borne in mind that the prismatic equivalent of decentring a lens and the effect of that decentred lens on convergence are

two distinct things, though at first sight they appear the same. Suppose we decentre a lens, or what is the same thing, suppose we place a normally centred lens precisely before one eye and associate a prism with it. We might anticipate that the angle of deviation of this prism would exactly express the effect on convergence. But it is not so. Fig. 33, B, represents a decentred lens, the action of which is precisely similar to a prism and lens, for, as said before, it is as if the lens were split in two, and the prism shown in dotted outline were inserted

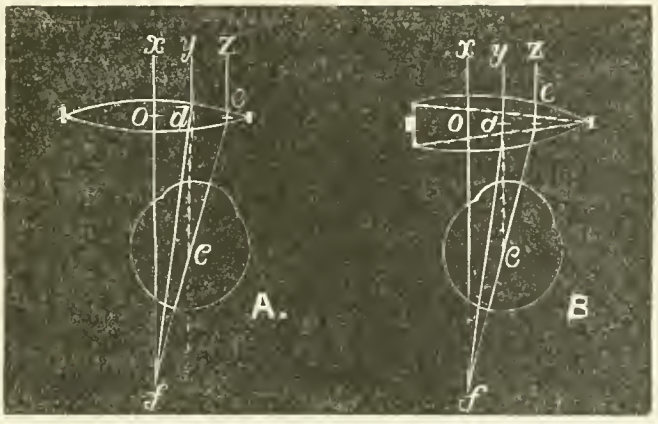

Fig. 33.—A. The right eye is looking at a distant object through a lens displaced inward, rim and all, by a distance *o d*; *d c e* is the effect on convergence. B is the same eye looking through a lens of the same focal length, but decentred in its rim by the same distance *o d*. The dotted lines indicate the prism that would be equivalent to the decentring, and the effect on convergence is the same as with A.

between the two halves. Now, it will be evident at a glance that the angle *c d f* is the deviating angle of the virtual prism, while the greater angle, *d c e*, is that which represents the effect on convergence. It makes no difference to the effect on convergence whether a lens is decentred or displaced to the same amount as in Fig. A.

There is one exception to the discrepancy between the prismatic equivalent and the effect on convergence, and that is when the lenses are convex and the object of fixation is at their focal length. Within that distance the effect on convergence is less, and beyond it more, than the prismatic equivalent. But with concave lenses it is always less.

CHAPTER V.

A BRIEF OUTLINE OF THE CHIEF CLINICAL APPLICATIONS OF PRISMS.

THERE are seven uses of prisms in the consulting-room which may be described first; then five more uses as worn by patients will follow, making in all twelve clinical applications. (In working with prisms, we are happily not concerned with the angle alpha, either in testing or prescribing.) Prisms are—

A.—OF SERVICE IN THE CONSULTING-ROOM.

1. To measure the absolute minimum of convergence (r^c). This is generally a negative quantity, and then the minimum of convergence of the visual axes is identical with their maximum of divergence. Its measure is therefore taken by finding the strongest pair of prisms, with their edge outward, compatible with single vision of some distant object, as shown in Fig. 34. The deviating angle of each prism expresses the

FIG. 34.—The Absolute Minimum of Convergence.

"absolute minimum of convergence" for each eye. The figure also makes clear that the visual axes meet behind the head during the experiment, and their point of intersection is still called "the far point of convergence," though its position is negative instead of positive. If a single prism be used, since its effect is distributed between the two eyes, its angle of deviation must be mentally halved for each. Remoteness of the point of fixation during the experiment is an important consideration if it is desired to reach the absolute minimum, for the knowledge of the object being at a great distance favors

the evolution of diverging energy, and in normal eyes the sympathy of convergence with the very beginnings of accommodation (even, for instance, for six metres) is very great ("Investigations," etc., Maddox, "Jour. Anat. and Phys.," Vol. XX., p. 574). If lenses are worn in the trial-frame, for ametropia, of sufficient strength, the experiment can be made by separating them if concave, or approximating them if convex, till double vision occurs, and then the prismatic effect can be calculated from Table III.

Thus if the distance between the optical centres of lenses of — 4 D be increased till it is 16 mm. greater than the distance between the centres of motion of the eyes, we divide the 16 mm. between the two eyes, for clearly each lens is displaced 8 mm., and therefore by the table there is 1° 50′ of divergence for each eye, or just one metre angle. It is expressed by saying that the absolute minimum of convergence is — 1° 50′. Dr.

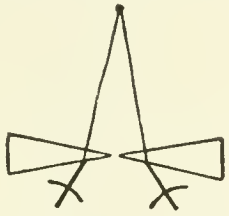

Fig. 35.—The Absolute Maximum of Convergence

Stevens finds that with vision for six metres the normal power of the abducting muscles is measured by a prism of 8°, or, possibly, 9°. He first corrects any existing ametropia, but does not appear to calculate for the prismatic effect of the lenses during the experiment ("Archives of Oph.," June, 1888, p. 163). Schweigger also gives 8° as the average strength of prism in *E.*, and quotes Schuurman as giving 5.6° as the average prism in *H.* and 11.6° in *M.* In making this test with M, refraction should first be corrected, and the effect of the lenses on the direction of the visual lines calculated for by Table III. In *H.* the test should be made both with and without lenses.

2. To measure the absolute maximum of convergence (p^c). Find the strongest adducting prisms, as in Fig. 35, compatible with single vision of a test type or printed page held as close to the eyes as accommodation will permit.

This test, though described for completeness, is not easily enough made with ordinary prisms to be much used, or to replace in practice the old-established custom of advancing a

finger toward the root of the nose till one eye deviates outward, or the use of Dr. Landolt's dynamometer, in which the finger is replaced by a line of light. The two last tests, however, it may be suggested, do not give the "absolute maximum of convergence," for as soon as the point of fixation passes within the binocular near point of accommodation, diffusion circles appear on the retinæ, and increase rapidly in size with every approach till the eyes resign the impossible task of accommodation—then the ciliary muscle relaxes, and with it the convergence.

Just as in absolute hypermetropia, efforts of accommodation cease as soon as the impossibility of obtaining sufficient definition is realized. These tests discover only, I believe, the point of the resignation of ciliary effort. Even were the accommodative efforts to persist, it is scarcely to be expected that two pictures on their respective retinæ, each composed of a mass of diffusion circles, should excite the desire for fusion in its full strength, as clearly defined pictures would. At first sight the highest adducting prisms compatible with single vision of a test type held at the absolute near point of accommodation would seem to give the true "absolute maximum" of convergence; but here there is a new difficulty, for the chromatic dispersion of the prisms spoils the definition of the pictures on the retinæ, though truly it might be avoided by using a monochromatic light. (Such light may be obtained of a pure yellow by placing common salt, or of a pure red by placing some salt of strontium, upon the wick of a spirit-lamp of which the flame is kept steady by incombustible gauze.) By adding the result of this test to the already ascertained "negative convergence," we get the "absolute range (amplitude) of convergence" (a^c), of which, according to Dr. Landolt, not more than one-third or one-fourth can be continuously in exercise for comfortable vision.

3. To measure the "relative range of convergence" (a_1^c). For this we find the strongest pair of abducting prisms, as shown in dotted outline in Fig. 36, and then the strongest pair of adducting prisms, as shown in continuous outline, compatible with single distinct vision of an object or type at some chosen distance. The distance most suitable is that at which the patient's daily work is done (occupation distance), and for which spectacles are most required.

The abducting prisms measure the negative part of the range (r_1^c), and the adducting prisms its positive part (p_1^c). This test would probably be the most valuable of any, if the best ratio between the negative and positive parts were well worked out for different distances of vision; meanwhile it may be gathered in large part from Fig. 57 of Donders' "Anomalies, etc." At twelve inches, for instance, the subject of his experiments had a relative range of nearly seven metre angles, the negative and positive parts being equal. At eight inches the relative range is slightly greater, but its parts are still equal. At six inches the positive part exceeds the negative. For distances greater than twelve inches the chart is incomplete on

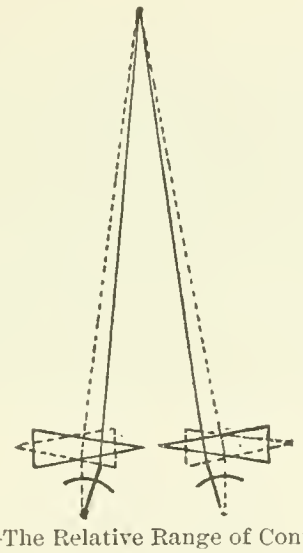

FIG. 36.—The Relative Range of Convergence.

the negative side, but the positive part is at 24 inches 3 full metre angles, and at 72 inches about $2\frac{1}{2}$ metre angles.

Since the relations between convergence and accommodation become temporarily altered by prolonged efforts to overcome strong prisms, all observations should be taken as quickly as possible; hence the rectangular trial-frame of Fig. 20 would be better than an ordinary one, since no time is wasted in setting a prism.

The principle of "rotating prisms," as introduced in America some years ago, should be a valuable one (these prisms are cogged edge to edge so as to rotate, one before each eye, in opposite directions at equal rates); but as I have not yet tried them, more cannot be said now.

In testing the ranges of convergence it is undoubtedly best

to use pairs instead of single prisms; then the deviating angle of each gives the result for each eye. Should, however, a single prism be used, its deviating angle must be halved for each eye; and should the pair be an odd one—that is, with one prism stronger than the other—half the sum of their deviating angles must be taken for each eye. The prismatic relief found desirable to give by any of these plans would of course apply to each lens in the spectacle-frame.

4. To dissociate convergence and accommodation. This is done by placing a weak prism with its edge upward or downward before one eye. One of 4° (2°d) is generally strong enough to create vertical diplopia which cannot be overcome in distant vision; but for near vision a stronger prism must be used. Graefe's was 15°.

In this way the stimulus to convergence is suppressed, and the eyes take that position, relatively to each other, which is due to the central association (in the nerve centres) between convergence and accommodation. Accommodation is in normal exercise and creates a definite proportion of associated or sympathetic convergence, which it is the purpose of the test to estimate. To give a simple illustration, we may compare the centres for convergence and accommodation to the two legs of a tuning-fork; the slightest vibration in one provokes vibration in the other. It is a perfect instance of irradiation, which appears to be a necessary accompaniment of all nerve-cell energy, but which is here economically gathered into a mutual channel between two confederate functions which are always associated in daily work. If the two images in this test appear in the same vertical line, the associated convergence is just equal to the accommodation; if they are not in the same vertical line, the diplopia is of course either homonymous or heteronymous. In the former case convergence is in excess of accommodation, and we say there is "relative convergence;" and in the latter there is a deficit of convergence, and we say there is "relative divergence." [By an easy paper experiment communicated to the Roy. Soc., Ed. (Pro. 1883–84, p. 433) for the author by Prof. Crum Brown, any one may convince himself that with dissociated distant vision some convergence of the visual axes is generally, though not always, present. This was called "the initial convergence." With accommodation for nearer distances, "associated or accommodative con-

vergence" is added to it till the "point of coincidence," where accommodation and convergence are abreast. For distances nearer than this there is generally relative divergence, which, after gradually reaching its maximum, again declines to a second point of coincidence near the near point of accommodation, and speedily gives way toward the absolute near point to relative convergence. These and kindred points will be found worked out in the "Jour. of Anat. and Phys.," Vols. XX. and XXI., in papers already referred to. The results were obtained by the "visual camera;" and to obtain similar ones it is essential to employ a method of the same kind which takes note of the tiniest aberrations, and allows them full time to occur in a field entirely dark but for the two points of light.]

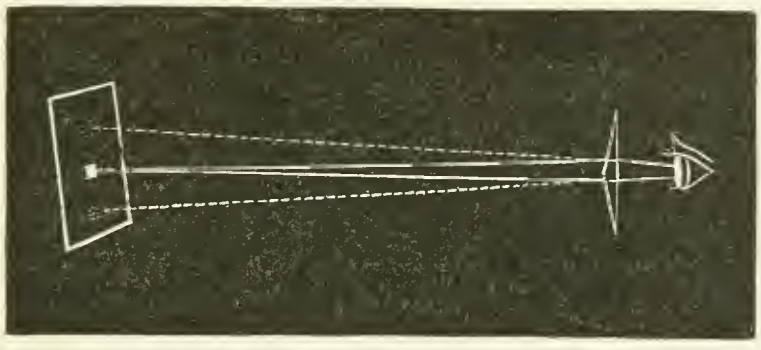

FIG. 37.—A Double Prism. From "Jour. Anat. and Phys.," Vol. XX., p. 496.

The point of fixation may be, according to Von Graefe's suggestions, either a distant flame or a vertical line with a dot situated upon it on a card. In the latter a fallacy has been shown, from the fact that the reduplicated line still creates a desire for single vision of those portions which overlap (Noyes, "Treatise on Diseases of the Eye," New York, 1882, p. 88). When a light is made the point of fixation, a double prism, like that in Fig. 37, makes it much easier to detect the condition present by observing whether the central image, which is seen by the unclad eye, appears to the right or left of the imaginary line between the other two, which are false images seen through the prism. The degree of deviation can be measured by finding the additional prism, edge in or out, required to bring the images into a vertical line, as suggested by Graefe; or the first prism may be rotated till the images are vertical, and then from the strength of the

prism and the degree of turning a calculation can be made of the deviation. (The sine of the angle through which the false image was displaced is the multiple of the sines of the angle through which the prism has been rotated, and the angle by which it deflects rays of light. Sin. x = sin. $\triangle$ sin. r.)

For near vision the double prism may also be used, as in the figure, or with a device marked on a card, which measures the deviation at the same time; but I have come to prefer a single prism, mounted with its edge upward on one end of a strip of wood along which a traveller bears the same device, which now appears only doubled as in Fig. 38 instead of trebled. It is of course desirable to make this test at the occupation distance of different patients, and if the scales are marked in degrees or metre angles a different one is necessary for each distance; if marked in mm. and provided with an indicator

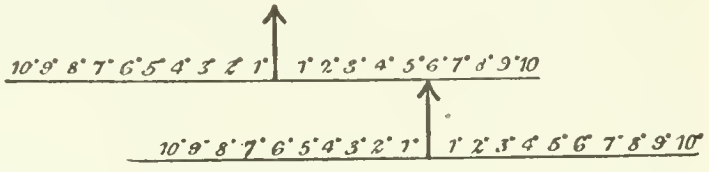

FIG. 38.—A Metric Device for a Single Prism. The lower row is marked on a card and the upper is its false image.

capable of being lengthened or shortened, one is sufficient, but a calculation is necessary.

What is the due significance to attach to this test? It clearly does not decide the strength of one rectus, for convergence is a single function affecting both eyes equally. It is true that each rectus is a link in the chain of convergence, and may be the weak link, but that would show itself best in testing the lateral movements of the eyes. Neither does it afford a pure test of the strength of convergence; for the converging innervation might respond in power to its proper stimulus and yet fall short of this test from its central communication with accommodation being abnormal or affected by disease. Neither does it entirely test the freedom of communication between the centres; for that might be perfect, and yet the test exhibit failure from some imperfect link in the chain of convergence It really tests all in a joint way, so that its full value only comes out when it is made for both near and distant vision, and is conjoined with some of the previous tests to interpret the exact import of its revelations: the way in which

these vary slightly according to the time of day, the state of the sympathetic system, and other conditions, has been described elsewhere ("Investigations," etc., J. A. P., Vol. XX., p. 568).

5. To disclose any tendency to vertical diplopia (hyperphoria). Accommodation and convergence are dissociated for this purpose by a prism with its edge outward, and slightly stronger than can be overcome—say one of 6°d. In this test especially, precision in the setting of the prism is essential, since imperfect setting can produce in a normal patient an apparent difference in the height of the two images. This is shown in Fig. 13.

Interesting cases of latent vertical diplopia, with very successful correction, have been recorded by many, especially in America. In making the test, the object should be a flame at the distance of six metres, and the full prismatic correction should then be given.

Instead of a single prism, a double prism with its axis horizontal, like that in Fig. 37, may be used, and it is not difficult for the patient to tell whether the central of the three images is equi-distant between the other two. Better still is a stronger double prism with each refracting angle of 10°: this is used with its axis vertical instead of horizontal, so that the three images appear in one horizontal line, and the patient is asked to say whether the central one is higher or lower than the line between the other two.

Yet a fourth, and perhaps easiest, way of making the test is to use an ordinary stereoscope ("Ophthalmic Review," "An Abstract," etc., Dec., 1886, p. 348), marked before one eye with a vertical line graduated in degrees up and down from a central zero point, and before the other eye with a horizontal line exactly level with the zero point just mentioned. On looking into the instrument, the horizontal line appears to lie across the vertical one; if it crosses it at zero there is shown to be no tendency to vertical diplopia; but if otherwise, the latter is present, and its amount is expressed by the figure which the horizontal line crosses, and which the patient is asked to read off. The stereoscope must be held horizontally and with care.

All these are "diplopia tests," or "equilibrium tests," since they depend on the dissociation of the eyes by the artificial creation of diplopia. But Stevens has shown the desirability

in these cases of also finding the highest prism, edge up, compatible with single vision, and the highest prism, edge down ("Archives d'Ophthalmologie," XVI.; 6; p. 544).

6. Prisms have sometimes been used to measure strabismus, or to measure the degree of any existing diplopia, but for this they are useless.

Not so, however, when the purpose is to ascertain by what proportion diplopia must be lessened to place its entire correction just within the control of the innervation concerned in the preservation of single vision. It suffices to find the weakest prism, with its base-apex line parallel to the line between the two images, which enables single vision to be effected. The deviating angle of this prism informs us of the proportion of the diplopia which is beyond control, and when this proportion is deducted from the whole diplopia, the remainder is the proportion which can be brought under control. It is sometimes advisable to prescribe prisms just strong enough to bring the diplopia well under the control of "the fusion innervation" (as it is sometimes named), but no stronger, so as to exercise the neuro-motor mechanism till its strength is regained. Compare p. 287. For homonymous diplopia the edge of the prisms must be directed inward, and for heteronymous (crossed) diplopia outward, or, in simpler words, "place its apex in the same direction as that in which the eye deviates; thus if the eye turns outward, the apex of the prism must be turned outward; if the eye turns in, the apex must be inward also" (Juler).

7. To decide the presence of binocular vision. The fact that a prism before an eye deflects the line of fixation has been turned to account by Graefe, in cases of suspected malingering, to see whether an eye has such a thing as a line of fixation, or in other words whether it is a seeing eye.

The following is perhaps the fullest plan. After fixing the patient's attention, we may first place a strong prism, say of 30° (edge in or out), before the sound eye. If, while doing this, the other betray no associated movement, vision is almost certainly binocular, for nothing but fixation could preserve it from accompanying the deflection of its fellow, except in paralytic cases. Should it move, however, nothing is proved beyond the expected fact that its fixation power is less perfect than that of the other.

The same prism is now similarly placed before the doubtful eye; if while doing so the other display an associated movement, vision is not only binocular, but the impugned eye is the better of the two, at least for the distance of vision employed at the time: but if there be no associated movement nothing is proved.

Lastly, on placing a prism of about 10° before the doubtful eye, and quickly withdrawing the prism, we closely watch the eye from which it is taken; for a corrective movement, if detected, at once tells us that its line of fixation has been deflected by the prism, and that it has therefore a line of fixation and is a seeing eye.

The subjective test, in which the patient's statements have to be relied on, is, for obvious reasons, often unsatisfactory, though it possesses the peculiar advantage of convincing a by-stander from the patient's own mouth, and of thus relieving the surgeon from the sole responsibility. It consists in placing a prism first before the unsound eye, and asking whether any object, preferably a flame, appears double. The reply is almost certainly negative. The prism is next placed before the sound eye, and the question repeated, "Do you now?" If incautious, the patient may admit that though he sees nothing with the bad eye, he sees double when the prism is held before the good one. A refinement has been introduced in America by first placing the edge of the prism partly over the pupil of the sound eye, to show the patient that vision may be double with that eye alone, when the other is covered by the hand. A stereoscope, however, with a circle on one side and a cross on the other, or Snellen's colored test types, afford better subjective tests than any with prisms.

B.—Prisms may be Worn in Spectacles.

1. To relieve any strain between convergence and accommodation (esophoria or exophoria). The existence and nature of the strain must, if possible, be first made out. An ideal investigation would include, after the usual study of accommodation: (1) The total range and region of convergence; (2) its relative range, with vision for occupation distance; (3) the effect of dissociating the two functions with both near and distant vision. But with present methods, to attempt all these

makes too great a demand on time, except for a few cases in order to form a groundwork for others; and in general, those tests must be selected which are most suitable for the case. How, when refraction also needs correction, to apportion the desired relief between displacing on the one hand and decentring or the addition of a prism on the other, has been shown in the previous section on "Decentring of Lenses." There is little to be gained from prisms stronger than 2°d.

Dr. Noyes' plan is to "first decide the proper working distance, and the correcting-glass which for this point is required, and with it ascertain the muscular error," by dissociation, etc. He adds: "To give prisms equal to one-half the amount of error is usually sufficient," and says further: "We must sometimes order prisms for permanent wear, either with or without a refractive correction, and this is indicated when a muscular error has been detected in testing for the distance of twenty feet. Here the correction of weakness of the externi, or of vertical diplopia, is of the utmost importance, and the full correction must be prescribed. . . . It is sometimes extraordinarily gratifying to see what relief is obtained by suitably-chosen glasses." What he terms "insufficiency of externi for distance and of interni for near vision" implies, he says, general muscular weakness, and indicates constitutional treatment and Dr. Dyer's "invigorant plan." This consists in giving the patient four squared prisms, of about $2\frac{1}{2}°$, 5°, 10°, and 15° respectively: twice a day for ten minutes he is to fix a flame or door-knob at twenty feet, and exercise abduction and adduction (really relative divergence and convergence), beginning with the weakest prism and mounting the ladder to the strongest. Dr. Noyes' following remarks are so apposite that we conclude this subject with them: "The true purpose of prisms for constant wear or for working is found in those cases in which the difficulty lies in want of balance between opposing groups by which one set predominates too much over the other, not in those cases where the muscular power as a whole is below standard. Weakness of all the muscles is seen in that tremor or jerkiness which the eyeballs show when fixed in some extreme position, or in the sudden jump which the globe makes on reaching a certain point as the eyes follow the finger slowly from one side to the other. The jump comes when another combination of muscles is required by the change

of fixation, and means that all do not conspire to an equable and smooth action" (Noyes, *op. cit.*, p. 94).

2. To relieve any tendency to vertical diplopia (hyperphoria). The existence and amount of the latent diplopia may be determined by one of the methods on p. 313. Then a prism whose deviating angle equals, or nearly equals, the angle of diplopia may be ordered. Since the degree is generally small, it is not often worth while to distribute the correction between two prisms. If the image seen by the right eye appears highest, a prism should be worn before that eye with its edge downward, just strong enough to bring the highest image to a level with the other; or the same prism with its edge upward before the left eye would amount to the same thing.

Oblique tendencies (hyperesophoria and hyperexophoria) are best resolved into their component horizontal and vertical elements to allow the first to be studied in connection with convergence and the second to be studied independently; but instead of prescribing separately the required horizontal and vertical prisms, a single prism is to be ordered of such a strength and so intermediate in the direction of its apex as to have their combined effect. For formulæ, see p. 324.

3. To correct persistent and incurable diplopia, if of sufficiently small degree. This is done by letting the patient wear a prism whose angle of deviation is equal to the angle of the diplopia, and whose edge is in a direction contrary to the displacement of that false image which is seen by the eye before which it is worn.

4. To train the neuro-motor fusion apparatus to overcome by degrees a curable diplopia, as in paralytic strabismus, or diphtheritic or other pareses. Thus Donders wrote: "We may further, in paresis of a muscle, so far meet the disease by means of a prism, that in order to make the double images which have been brought near one another run together, the muscles will become powerfully tense which, for the alleviation of the paresis, appears to be no matter of indifference" ("Anomalies," etc., p. 134). If one rectus alone be paralyzed, the prism should be worn before the eye of that side, but if a conjugate innervation be affected, each eye should be supplied with a prism. In either case their strength should be such as to relieve that proportion of the diplopia which is beyond the

control of the fusion function, but not strong enough to let the whole diplopia be overcome without a slight and harmless effort. At regular intervals the diplopia should be measured, to note its gradual decrease and to order weaker prisms accordingly, which will still stimulate the paretic structures, till they regain control of the diplopia altogether, without the further need of prisms.

An undoubted difficulty in this treatment consists in the variations of the relative positions of the images in the different parts of the field of fixation. Schweigger seems to go a little too far in saying: "The correction of diplopia by prisms is indicated only when there exists secondary contraction of the antagonistic muscle, and, as a consequence of that, diplopia throughout the entire field of vision," and "the prisms should be chosen of such a strength as to correct only that part of the diplopia which is due to this contraction of the antagonist" ("Handbook of Ophthalmology," trans. by Farley, 1878). See the Appendix, p. 323.

5. To relieve convergence for near work in some cases of short sight, where it is impracticable to remove the occupation distance, by concave lenses alone, far enough to avoid excessive converging effort. But this application of prisms is very limited, owing to the weight, to the illusory properties, and to the chromatic aberration of the prismatic combinations. Any tendency to divergent strabismus would be aggravated by this method, and even without that tendency being noted, such spectacles should be very carefully guarded from any attempt to employ them in distant vision, even if necessary by surrounding the desk or other scene of work by a light screen at such a distance that the visual axes can never become divergent. For the same reason distant vision spectacles should have their optical centres no further apart than the centres of rotation of the eye; otherwise they cause actual divergence of the axes, the muscular strain of which is perhaps as detrimental to the coats of the eyes as that of excessive convergence. I have seen a myopic patient in whom spectacles prescribed by one of universally recognized skill caused discomfort for years, and were then improved upon by a pair selected at random by himself from a common store; no doubt the refraction was perfect, but the optician had received no intimation of the position of the lenses, and for myopic children

especially, spectacles are very apt to be too wide. In some patients, the movements of the elongated eyeballs are so hampered that convergent strabismus appears in distant vision and divergent strabismus in near vision. In such cases, if the two kinds of strabismus are not too extensive, the distant-vision spectacles may well have their lenses decentred (not displaced) outward, and those for near vision be displaced (and, if necessary, decentred also) inward. Displacing is, for distant vision, less advantageous than decentring, since it interferes with the binocular field of fixation which it is here important to preserve. Schweigger says of prismatic spectacles for the muscular asthenopia of myopia that "they may be used with special advantage when it is possible to employ a working distance of at least ten or twelve inches" (*op. cit.*, p. 172).

There are other applications of prisms, such as to wear a pair with their edges inward to enable hypermetropes to accommodate more easily (a sure way to develop convergent strabismus), and Culbertson's prisoptometer, in which a double prism is used to reveal anomalies of refraction, but they need not detain us. Another interesting use of prisms is to make manifest the presence of what Dr. Stevens calls "habitual unconscious diplopia." The suppressed picture of a flame, as has been long known, becomes often manifest on placing a weak prism before the eye, even though it be in the direction of correcting the diplopia. In other directions, however, it might be acting by creating diplopia. Lastly, it may again be mentioned that prisms should never be prescribed without a fair preliminary trial.

APPENDIX.

Till attention was kindly called to it by Mr. Charles Wray, F.R.C.S., I was not acquainted with the work of Dr. Stevens, of New York, whose thoughtful papers in the "Archives d'Ophthalmologie" (VI., 6) and the "Archives of Ophthalmology" (Vols. XVI. and XVII.) well repay perusal. They deal with the subject of faulty tendencies of the ocular muscles, not so much from the optical standpoint as with a view to afford surgical relief by a modified form of tenotomy. He has introduced a new nomenclature, as follows:

I.—Generic Terms.

Orthophoria.—Tendency of the visual lines to parallelism.

Heterophoria.—Tendency of these lines in some other direction.

II.—Specific Terms.

Heterophoria can be divided into—

(1) *Esophoria.*—Tendency of the visual lines inward.

(2) *Exophoria.*—Tendency of the lines outward.

(3) *Hyperphoria* (*right* or *left*).—Tendency of the right or left visual line to place itself in a direction above that of the opposite side. "This term does not imply that the line alluded to is too high, but only higher than the other, without indicating which of the two is defective."

III.—Compound Terms.

Tendencies in oblique directions can be expressed in the following manner:

(1) *Hyperesophoria.*—Tendency upward and inward.

(2) *Hyperexophoria.*—Tendency upward and outward.

The designations right and left must be added to these terms. He says: "In registering the respective elements of these compound expressions, I employ the sign ⌊. For example, if we wish to indicate that the right visual line tends

above its partner by 3°, and that it has a tendency inward of 4°, these facts are inscribed as follows: Right hyperesophoria: 3° ⌊ 4°" ("Archives d'Ophthalmologie," VI., 6, p. 542). The tendencies of the visual lines thus classified must not be confused with actual deviations, as in strabismus. In strabismus, to which he gives the name of heterotropia (τροπος, a turning), there is habitual (conscious or unconscious) diplopia, but in heterophoria (φορος, a tending) the visual lines only tend to deviate, and are restrained from doing so by extraordinary fusion effort, so that binocular vision is habitually maintained, but at the expense, often, of headaches and other nervous symptoms. These faulty tendencies are, in short, what have long been known as "dynamic (or potential) squint" (Von Graefe), or "latent squint" (Alfred Graefe).

Dr. Stevens retains the old expressions abduction and adduction in their usual sense, as representing the diverging and converging action of an eye, by which it overcomes a prism with its edge out and in respectively, and contributes the new term "sursumduction" for the overcoming of a prism with its edge up or down, and says: "It often happens that the images can be united when a prism is placed before an eye with its base up or down, but that diplopia occurs if the prism is inverted, or if it is placed in its first position before the other eye." The standard distance at which he makes his tests is twenty feet, with the head in the primary position, and any error of refraction corrected, though it does not appear whether the effect of the lenses is accounted for. He says, "The usual power of the abducting muscles in orthophoria is measured by a prism of about 8°, or possibly 9°," and of the adducting muscles by one of 50°, while the powers of sursumduction are normally measured by a prism of 3°. In manifest strabismus, diplopia is generally difficult to demonstrate, owing to habitual suppression of one of the images, but a red glass before one eye, or a weak prism, may make it evident.

Dr. Stevens believes that hyperphoria rarely exceeds 4°, and if any case appears an exception to this, hypertropia is to be suspected, and the suspicion is made almost a certainty if combined with it there is a lateral deviation of more than 6°. Esophoria of more than 10° or exophoria of more than 8° is not likely to be found with maintenance of binocular vision ("Archives of Ophth.," June, 1888, p. 163). His experiments are

made with an apparatus called a "phorometer." It consists of a vertical standard, supported by a tripod, and adjustable for differences of stature. It bears a hinged arm, which may be horizontal or be used at any inclination notified by a scale of degrees, or it may be folded down altogether. At the hinged extremity it is provided with a spirit-level, and in a groove along its upper surface, carriers bearing prisms can either slide or be removed at will. Instead of simple rectangular prisms, two discs can be used, each consisting of six prisms united at their apices, so that on rotation prisms of increasing strength come before the two visual apertures. A tablet, marked with a small cross on one side and a larger one on the other, is held by a rod at the distance of half a metre from the prisms, or at any other desirable distance. He first places the patient in the primary position, six metres distant from a flame, with the ocular muscles relaxed and any refractive anomaly corrected; and then tests for hyperphoria by a prism, edge out, stronger than can be overcome. If the two images are at different heights, hyperphoria is demonstrated and is measured by that prism which, with edge up or down, brings them to the same level. He next tests for esophoria or exophoria by a prism, edge up or down, too strong to be overcome, and measures the amount of deviation by the prism which, with edge in or out, makes the images vertical. Eyes, therefore, are characterized as eso- or exophoric, etc., when they are shown to be so by tests made at the standard distance of twenty feet, and for the results of near-vision tests Dr. Stevens proposes to speak of "exophoria in accommodation," etc., but this is scarcely precise enough, and it will be better to mention the exact distance of the test, and speak of exophoria at twenty feet, esophoria at ten inches, and so on.

I have drawn up the following series of prismatic tests for cases of suspected nerve trouble from heterophoria:

A.—With Flame at Twenty Feet.

1. With prism of 10°, edge out, or a stereoscope, test for hyperphoria (p. 313).

2. With prism of 4°, edge up, test for esophoria or exophoria (p. 310).

3. Find highest prism, edge out, compatible with single vision (p. 306).

4. Find highest prism, edge in, compatible with single vision (rarely necessary) (p. 321).

5. Find highest prism, edge upward, compatible with single vision (pp. 321, 322).

6. Find highest prism, edge downward, before the same eye, compatible with single vision (pp. 321, 322).

B.—With Fixation for "Occupation Distance."

1. Find highest pair of prisms, edge out, compatible with single vision (p. 308).

2. Find highest pair of prisms, edge in, compatible with single vision (p. 309).

3. With a prism of 10°, edge up, test for esophoria or exophoria at working distance, using a device to measure the amount, as in Fig. 38 (p. 312).

C.—With Fixation for the Absolute Near Point of Accommodation.

Find the highest prisms, edge in, compatible with single vision of test types, or use Landolt's dynamometer (p. 308). (The usual "finger test," the "cover test," the lateral movements of the eyes, and the distance of each eye from the middle line, are observations which should not be omitted.)

As to prescribing prisms for recent paralytic strabismus, Dr. Noyes puts the matter well in the following quotation: "Double vision which concerns fixation 10° above and for all the field below the horizontal meridian, or which concerns the median region of fixation, is the most distressing, and calls loudly for aid. The office of prisms is usually confined to these regions, namely, on the median line, or for parts, on or below the horizon. In fact, to extend their influence over the whole field is impossible, because the relations of the double images become entirely different in its different parts, and it is impracticable to adapt the prisms to these changes" (*op. cit.*). Dr. Stevens makes an important observation to the effect that slight vertical tendencies (hyperphoria) may modify the adducting or abducting power considerably, and mentions cases in which marked esophoria in distant vision, and exophoria, or even diplopia, in near vision, disappeared after some coexisting hyperphoria had been remedied by a slight tenotomy. We have seen that Dr. Noyes had attributed these

conditions to general weakness of the ocular muscles, and it is well to bear both causes in mind. Dr. Stevens finds that the whole of a faulty tendency is rarely revealed by a test with prisms, and that part still remains latent, which indeed might have been expected; and says that "instances of even approximate balancing of the eye muscles in anisometropia are rather exceptional," and also that hyperphoria is generally associated with monocular amblyopia, which he attributes to mental suppression of one image during occasional periods of diplopia. This reason appears scarcely valid, for however legitimate it may be to speak of "amblyopia ex anopsia" in cases of complete and long-standing strabismus, we can scarcely suppose that intermittent diplopia could bring it about. Yet were the diplopia persistent the case would not be one of hyperphoria, but of hypertropia. The cause is more probably to be found in the same unilateral defect of development as that to which the anisometropia and the hyperphoria itself are due. Dr. Stevens prefers to perform a very delicate tenotomy for cases of heterophoria rather than to prescribe prisms. Dr. Webster, following in his footsteps, also performs tenotomy, but only when all other means have failed and the nervous consequences of the anomaly are serious. He places the eye under the influence of cocaine, and tests the muscular equilibrium by prisms at intervals through the operation. ("Oph. Review," VII., 363).

An account of some ingenious devices for testing the conjugate tendencies of the eyes will be found in papers by Dr. Ward A. Holden, of Cincinnati, in the "Archives of Ophthalmology," September, 1887, p. 295, and December, 1887, p. 403.

Resultant prisms, as recommended on p. 317, are prescribed as follows: Let R be the deviating angle of the prism required to combine the effects of a vertical and horizontal prism: let V be the deviating angle of the vertical prism, and H that of the horizontal one; then $\text{Sin. } R = \sqrt{\text{Sin.}^2 V + \text{Sin.}^2 H}$; and if r be the angle of rotation from the vertical,

$$\text{Sin. } r = \frac{\text{Sin. } H}{\text{Sin. } R}$$

We thus obtain both the strength and position of a prism whose effect will be the resultant of the other two, and an ordinary table of logarithmic sines makes the calculation a very brief one.

ELECTRICITY

IN THE

Treatment of Uterine Tumors.

BY

THOMAS KEITH, M.D., LL.D. EDIN.,

AND

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ELECTRICITY IN THE TREATMENT OF UTERINE TUMORS.

To Dr. Georges Apostoli.

DEAR SIR:—Will you allow my son and myself to dedicate to you the following account of our first attempts to follow you in your treatment of uterine tumors by electricity? It is all we can offer you for the kindness with which you received us at the various visits we have paid to your clinique. You gave us every information; you put everything at our disposal; the notes of every case treated by you for the last five years were open to us. For all these things accept our hearty thanks.

Since we began your treatment, now more than two years ago, we have ceased to perform any operation on the uterus by abdominal section. For myself, I have always had grave doubts if I were justified in performing such operations at all, especially hysterectomy, for the mortality attending this operation is out of all proportion to the natural history mortality of uterine tumors, and the results of it are out of all proportion to the benefits received by the few. As time went on, and the number of operations became larger, my doubts as to whether I were doing right continued to increase, and that too in spite of the comparatively low mortality with which I was favored, more especially in my private practice. I never had any such doubts as to the propriety of performing ovariotomy, for if ovarian cysts be let alone, death is almost certain, and even that is only reached after great suffering. With hysterectomy it is quite different. Hysterectomy is a hazardous operation for the removal of a tumor that of itself rarely shortens life. The minor operation, on the other hand—the removal of the ovaries—requires no surgical skill for its performance.

It is a great mutilation to a woman, being simply castra-

tion; and women are beginning to find this out. It is not always successful in attaining its purpose, for you will find in these pages some cases narrated that were cured by electricity, where operations on the ovaries had failed to give any relief.

Your method thus came to me at a very opportune time. You have taken away from me those anxious doubts and fears that had so long vexed me. For this I shall ever feel grateful to you. Leaving out hysterectomy, abdominal surgery is comparatively plain sailing, now that the principle of early operation in ovariotomy is fully recognized. Things are very different in this respect from what they were twenty or twenty-five years ago.

For long, I had hoped much from electricity in the treatment of fibroids, but had only met with disappointment till your method was made known to me. It is in every way a new method, and it belongs to you, and to no other. You have worked in the true scientific spirit. For five years you labored quietly at your clinique, kept up at your own expense, and open to all, before you made your work known. When it was made public, and ought to have had from all a warm welcome, or at least a patient hearing and honest investigation, considering the magnitude of the work, it was received with unbelief and ridicule.

In common with many, I regret the unfair treatment you have received in this country. In spite, however, of the ignorance and prejudice displayed, your work is every day making its way, and it is impossible to resist the accumulating evidence there now is in its favor. That you will in a few years see your treatment adopted all over the world I have little doubt; and no one can wish you success more heartily than I do.

Believe me, dear sir,

Yours truly,

THOMAS KEITH.

In the following pages we tell, in the simplest language, the story—perfect or imperfect, or merely experimental—of every patient with uterine tumor who, up to the end of last year, submitted herself to be treated by electricity. We have followed Dr. Apostoli's method to the best of our power, and we have always found him an exact and truthful guide. It is

therefore needless with the ample instructions he has given, to go over the details of his process. Those who are acquainted with his work will easily understand our ways. No attempt at classification of the cases has been made. We leave every one to draw his own conclusions.

Various circumstances have interfered with earlier publication. For long we had doubts as to the permanency of the treatment in the early cases. The later work has been much more satisfactory. But now more than two years have passed, since all operations were given up for this treatment; and our first patient writes—and no one could have had more hemorrhage—that she has been perfectly well all summer, climbing hills and rowing in a boat. Another of the early and doubtful ones, who could never bear a large dose of electricity, tells us, —"I am now in excellent health, without an ache or pain of any kind, and my periods are just a show and nothing more, and give me no discomfort whatever. I hope you have been as successful with all your other patients as you have been with me. But it cannot be otherwise, for I am sure that no one could have been worse than I was with that awful hemorrhage." This patient's importunity had almost driven me into doing hysterectomy for her.

The cases are narrated in the order in which they presented themselves. Every one is given, as well as the amount of every dose of electricity, even in one of the dispensary cases, though only a single application was made. In these dispensary patients there was much trouble and loss of time in finding out their after-history. This was, however, obtained in nearly every case, though it necessitated two special journeys to Edinburgh to search them all out.

About half of the cases that presented themselves were sent away without any treatment, simply because the tumors were giving little or no trouble, or they were near the menopause where no treatment was necessary. At first we fell into the natural mistake of trying electricity on every case that presented any symptoms—in some, when the tumors were almost certainly sarcomatous, and even in one, who was in the last stage of old cardiac disease; still we give every one of these. We know now that the cases best treated are those who are suffering much from hemorrhage—the more the better—cases in which something must be done; cases in which

two or three years ago, the question of operation of some kind would have been considered by us.

In only a single case during the last two years was hysterectomy proposed and agreed to. The patient was sent by Dr. Dow, of Dunfermline, was 42 years of age, and the tumor had grown for fifteen years. In spite of monthly losses and the size of the tumor—not far off from 50 pounds in weight—she had the management of a large farm, and was able to be out of doors to look after things, summer and winter, by six o'clock in the morning, so little trouble had the huge tumor given her. Till three months before she came, she had suffered nothing. She then had a severe attack of pain over a limited area. We had not at that time much more than begun Dr. Apostoli's treatment, and, considering the huge size of the tumor, it seemed better to advise hysterectomy. This was willingly agreed to, and the operation was arranged for two days after. Next afternoon she lay down after dinner, and the nurse was about to leave her to repose, when she cried out with pain over the heart, and died in a few minutes. How easily we might have had to report a death after operation, or after electricity, had that been tried!

This treatment, it must be remembered, is a new thing. We began it in comparative ignorance. Electricity is known by its results, and, working on the living body, progress and improvement are slow. In the following cases, therefore, are found some failures and some imperfect and incomplete cases; the marvel rather is that there are so few. Time and experience every day correct our want of knowledge and diminish these imperfections. It must also not be forgotten that the cases treated were the worst possible, both as to the size of the tumor and the severity of symptoms. We will probably never again have such a series of bad cases to treat. Those who have practised ovariotomy only during the last twelve or fifteen years, know little what the operation was twenty-five or more years ago, in the early days of abdominal surgery. When patients with uterine tumors come for treatment by electricity, at an earlier stage than they do now, then may reasonably be expected the same ease of cure as is now the case in ovarian disease. The need for the removal of ovaries for small uterine tumors, and of hysterectomy for large ones—except in the rare form of fibrous cystic tumors—will then pass

away. No large uterine tumor has with us entirely disappeared under the electrical treatment, but in four cases of small fibroids, three of which come into the present series, there is not now a trace to be found. Doubtful cases of simple enlargement have been excluded altogether, though in every one of these the result has been perfect.

The carrying out of this treatment faithfully to the end is not an easy matter, and old tumors that are large, and that have bled for many years, take a long time to improve. The treatment runs away with time, and it requires care and thought. To the surgeon, by far the simpler plan is hysterectomy and the removal of the ovaries. But Dr. Apostoli's treatment saves our patients from risk of life by operation, and saves them also from a horrid mutilation—the one thing that they all dread. We believe it to be the right treatment, and our patients must get it, however great the inconvenience and monotony of it may be to ourselves. Though our results after hysterectomy show the lowest mortality of any yet recorded, and though we have had but a single death after removal of the ovaries for fibroid in almost one hundred operations, we reject even the minor operation in favor of Dr. Apostoli's treatment, and we reject hysterectomy altogether on account of the mortality that has hitherto attended it all over the world. The method given us by Dr. Apostoli is good, and it will endure. We have no fear now of its passing away and being forgotten.

Case I.—Married, age 45, was sent to Edinburgh by Dr. M'Nee, of Inverness, for operation in the month of June, 1887.

We had determined to give Dr. Apostoli's treatment a fair and extensive trial, and advised this lady to wait until the apparatus arrived. Fortunately her husband, who was much troubled with stiffness and pain due to rheumatism, had received much benefit from the faradic current, and was therefore a believer in electricity. They were willing to do anything to avoid the risk and anxiety of an operation, even to be experimented upon, so far at least as to be our first case. Her history was as follows: She had never been pregnant, and up to the age of 40 had enjoyed good health; the periods were regular, and were not in excess. Between the age of 40 and 41 there was a change. The time the flow lasted began to be

prolonged, and the quantity of blood lost steadily increased. Keeping pace with this, the general health began to suffer, she became breathless and anæmic, and for some time past the discharge has continued for about two weeks, and has returned sometimes after an interval of one week, sometimes after an interval of two weeks, but she is never dry for longer than two. She has to remain in bed for at least one, and sometimes for two weeks at a time, or, in other words, from three to six months in the year. While lying in bed she is afraid to do anything for herself, as even the simple raising of the arms above the head will cause a sudden rush of blood from the womb. After the period she is unable to walk up-stairs without assistance. When the bleedings began to be severe she took ergot in large quantities with marked benefit for a time. Of late, however, it has not been of service, except that she thinks that perhaps the bleeding would have been worse had the drug not been taken. About the beginning of the year the tumor was first noticed.

The patient is very anæmic and breathless; and on examination the tumor is found to extend to fully three inches above the pubes. The cervix is situated far back, and there is some difficulty in passing a sound to a depth of three and three-quarters inches. It was evident that this was a case for the use of the positive pole in the uterine cavity.

June 15th, 80 milliampères for 6 minutes. Fortified by what we had seen at Dr. Apostoli's clinic in Paris, we allowed the patient to walk home to her apartments, a distance of perhaps 300 yards. Next day the patient was found to be certainly not any the worse, and a slight bloody discharge had stopped. 18th, 100 milliampères for 5 minutes. This application was again well borne, no pain being complained of. 20th, 90 ma. for 6 minutes. 22d, 100 ma. for 10 minutes. Feels very well indeed. 23d, there was a little bleeding from the uterus in the morning, which stopped by mid-day. 24th, slight bleeding all day. 25th, the third day of the period, and the patient is in the best of spirits, and although not in bed, has less discharge than for several years. 26th, still very well. 27th, the flow increased during the night, and is still bad. 28th, flow still severe. 29th, much less during the night; free during the day. 30th, much the same as yesterday.

July 1st, no bleeding since last night. 2d, 120 ma. for 8

minutes, followed by bleeding at night. 5th, 120 ma. for 8 minutes. 8th, 9th, and 11th, 120 ma. for 10 minutes. 13th, 90 ma., and 15th, 95 ma. for 8 minutes each. Feels very much stronger and better in every way. 18th, 80 ma. for 8 minutes. 20th and 22d, 90 ma. for 10 minutes. 25th, 85 ma. for 10 minutes. 27th, the period has come on to-day, after an interval of nearly four weeks. This is a longer space than for three or four years.

August 8th, 90 ma. for 10 minutes. The period has lasted but six days, and the bleeding was severe for a few hours only. Does not feel much pulled down. 10th, 90 ma. 12th, 95 ma. 15th, 95 ma. 17th, 80 ma. 19th, 90 ma. for 10 minutes each.

The patient went home after this, the twenty-first sitting, in the best of health and spirits.

After-history, taken from letters from patient's husband to us:

November 17th.—"I beg to inform you that Mrs. R. has passed through another of her periods, which was longer in duration than the two former ones, although accompanied by less hemorrhage. It commenced on Saturday the 5th, and was scarcely noticeable for three or four days, after that it was more perceptible, until the 15th, when it vanished. The last two days there was very little. She did not go to bed during the day, and feels quite strong now."

December 22d.—"I am glad to say that your treatment has made her like another person."

January 27th, 1888.—"I am happy to inform you that Mrs. R. has just passed through another of her monthly periods, very easily, something similar to what used to be previous to her tumor affliction. She had not to go to bed during the day, and now feels quite strong."

August 27th.—"Mrs. R. desires me to acknowledge receipt of your kind note of inquiry, dated 24th inst., and to thank you very much for your remembrance of her case, and to say that her February period was light; March, April, May, June, and July, scarcely any bleeding; but during her August one a good deal, which was not to be wondered at, seeing there was next to nothing the five previous months."

September 7th.—"Mrs. R. had arranged to have her photograph taken on Saturday last, the 1st inst., but her Sep-

tember period coming on prevented her. She wished to have a card freshly taken to show you how ruddy and well she was looking; but this turn has made a very great change on her—she is now white and weak.

"The first day there was not much bleeding; the second there was more; on the third, fourth, and first half of the fifth there was much—very much; but less and less every day since."

October 24th.—"Since I wrote you about Mrs. R., her October period has come and gone. She was not nearly so bad this time, although there were five and a half weeks between the October and September ones. Mrs. R. desires me to inclose her photograph, which, I think, will testify to her being in pretty fair health."

January 21st, 1889.—"Since I last wrote you on the 24th October, Mrs. R. has only had one slight—very slight—period, and that on the 17th November; thus nine weeks have passed without any indication of another. She is in good health and spirits."

It is interesting to note that there is not any mention of the condition of the tumor. The tumor itself was evidently considered of no importance as long as it did not give rise to symptoms. A thoroughly sensible view of the case.

Unfortunately, we cannot be sure that the strength of the currents recorded is correct; but there is certainly not a difference of 20 ma. either way.

Case II.—Married, age 60, was in the habit of appearing every few months in the ward, which was at that time set apart for the treatment of ovarian and uterine tumors in the Royal Infirmary, Edinburgh.

She had had a tumor in the abdomen for at least twenty years. This mass had not followed the usual history of these growths, for it had continued to increase in size after the menopause. The last period was eight years ago. In March, 1887, the old lady insisted that the tumor was growing, and that it was giving her much more inconvenience. She complained much of difficulty in walking and of dyspepsia. Careful measurements of the tumor were made in order to determine whether there were any increase in size or not. The circumference was 42 inches at the level of the umbilicus. In the month of June the circumference was still 42 inches; but other measurements showed a slight but decided increase in

size; and as she complained more than ever of the pain in the left side, for which pain, by the way, she had had plenty of treatment from one and another doctor, it seemed to be a fair case upon which to try the electrical treatment. In the pelvis the vagina was found to be drawn out into a funnel toward the left, and the cervix could not be reached. The case was thus evidently one which would require to be punctured, and where the puncturing needle would be connected to the negative pole of the battery. Owing to the reason which will be described later on, the treatment had, in this case, to be limited to five applications, and the strength of the currents used is possibly not correctly stated.

June 21st, 1887.—A current of about 80 ma. was passed for 5 minutes from the clay pad on the abdomen to the exposed point of the needle, inserted into the tumor from the vagina. The passage of the current caused simply a little discomfort. On withdrawing the needle there was not any hemorrhage. The vagina was washed out, and a pad of iodoform gauze pushed against the spot where the puncture had been made. The patient walked home, and next day felt none the worse.

On the 27th, a current of 100 ma. was passed through the tumor in the same way and for $7\frac{1}{2}$ minutes. A little more pain was caused by the treatment. The circumference was found to have diminished 1 inch. She felt much better for this application, and on her way home, and when passing through a garden, said to a friend who was with her that she felt as if she could dance on the grass.

On the 4th of July the circumference was $40\frac{1}{2}$ inches. On the 7th, the strength of the current was about 60 ma., and was not so well borne. On the 11th, the application was again borne badly, the strength being about 40 ma. The circumference was 40 inches.

On the 15th, it was not possible to puncture the tumor with safety. The appearance of the abdomen was much changed, the tumor was more nodular, appeared to be smaller, and could be pushed somewhat from one side to the other, instead of being immovable as it had previously been.

19th inst.—A current of 70 ma. was passed for $7\frac{1}{2}$ minutes. The patient was in great spirits, for she had, the day before, taken in her stays instead of letting them out, as had been necessary for a number of years.

On the 12th August, failed to find a spot where the pelvic part of the tumor could be punctured, as it had become much smaller and was entirely protected by the bladder. Much to the disappointment of the patient the treatment must be discontinued in the mean time at least. She has, however, gained much; she can walk better, and has not any difficulty in going her own messages and attending to her house; she can eat well, and in every respect feels decidedly better.

November 19th.—The circumference is 39½ inches.

February 23d, 1888.—Still keeps well, seven months after this short course of treatment.

In August, became hemiplegic, and has not been heard of since.

Case III.—Married, age 31, came to the Woman's Dispensary, Edinburgh, in July, 1887.

This patient had been married for three years, and had never been pregnant. Before marriage she noticed that her monthly periods were becoming prolonged, and that she was losing more blood than formerly. Now, the flow lasts a week instead of one or two days. For nine months there has been a feeling of bearing down, and also a constant gnawing pain in the right groin. She has four sisters, none of whom have had any trouble with their uterine functions.

On examination in the vagina, the os uteri is felt to look forward, and on placing the hand on the abdomen the uterus is found to reach to 2 inches above the pubes. The sound passed directly backward, and then slightly forward, to a depth of 2½ inches. On depressing the handle, however, it slipped in fully ¾ of an inch farther.

Treatment.—Until the end of November the current strength is not absolutely correct.

July 7th.—80 ma. for 5 minutes. On the 15th the patient came to say that she was menstruating, and that, although she felt very tired the day after the application, she was now feeling better than usual. 22d, 50 ma. for 5 minutes.

August 8th, 60 ma. for 5 minutes. Was not much inclined to have the application to-day, as she considers herself cured, and, against advice, does not intend to come back. However, as there was some return of the pain toward the end of the month, the treatment was resumed. 29th and 31st, 80 ma. for 5 minutes.

September 5th, 60 ma., and 16th, 40 ma. for 5 minutes each. The pain is better. The period is over, and as there has been more blood lost even than usual, the internal electrode will be positive instead of negative, as heretofore. 19th, 40 ma. 21st, 60 ma. 26th, 40 ma. 28th, 40 ma. for 5 minutes each.

October 3d, 40 ma. 5th, 40 ma. 19th, 40 ma. for 5 minutes each. Again there has been too much flow during the period. In other respects the patient is well. 26th, 40 ma. for 5 minutes.

November 2d, 80 ma. 9th, 80 ma. 23d, 60 ma. 25th, 60 ma. 30th, 75 ma. for 5 minutes each.

December 2d, 75 ma. 5th, 90 ma. 9th, 100 ma. for 5 minutes each.

January 9th, 1888, 75 ma. for 5 minutes. There has been less flow at the last two periods. 14th, 75 ma. 20th, 65 ma. 23d, 65 ma. 27th, 75 ma. for 5 minutes each.

February 6th, 100 ma. for 5 minutes. The tumor has become very much less, and cannot now be felt from the abdomen. 11th, 100 ma. 22d, 140 ma. 27th, 130 ma. 29th, 160 ma. for 5 minutes each.

March 2d, 200 ma. 5th, 190 ma. for 5 minutes each. No enlargement of the womb can now be detected, and the sound enters barely to the extent of 2½ inches. Thirty-five applications in all. In September there was not any pain, the periods were normal, and the woman had gained weight, and said that she felt quite well.

Case IV.—Single, age 43, was admitted into the Royal Infirmary, Edinburgh, in December, 1886.

For three years the patient says that she has been subject to great losses of blood every month, and has become weak and ill. In August of this year two soft red masses the size of the fist were passed from the vagina. A month afterward, Mr. Teale, of Leeds, dilated the cervix and removed part of a soft friable tumor, which he was much inclined to think was malignant. For a month or two there was improvement, but by December the patient was as ill as she had been before.

December 16th.—During the night two large masses, weighing half a pound, of what appeared to be firm clot were passed. These were examined by Dr. H. A. Thompson, and were found to consist of partially organized clot. There has been profuse discharge to-day, accompanied by severe pain, and the tumor,

instead of being smaller, is fully two inches higher than it was before.

December 19th.—The discharge is less, and the tumor has gone back to its former size.

December 29th.—Another large piece of partially organized clot was passed.

January 6th, 1887.—The ovaries were removed, the usual number of students being present. The left ovary was got away with difficulty on account of omental adhesions. On the right side the ovary was close to the tumor. The Fallopian tubes were also removed. There was not any disturbance after the operation, the pulse never being quicker than 84, and the temperature was normal throughout.

February 3d.—The tumor is swelled up.

February 5th.—The period has come on, and a mass has been passed from the vagina.

February 10th.—Went home, there having been much less discharge than usual.

June 17th.—Was admitted into hospital again. The patient has not been better for the operation. There has been scarcely any hemorrhage, but there is a constant and very profuse discharge with very offensive smell, and occasionally a clot is passed. The temperature is fully 102°. The patient does not look so well as she did after the operation, and is very anæmic. The os uteri is dilated to the size of a shilling, and projecting from it is a sloughing mass. The tumor extends to midway between the pubes and umbilicus.

June 19th.—The whole of the sloughing part of the tumor was removed, and as much as possible of the remainder. It was not considered advisable to entirely empty the uterus, as the bleeding was profuse and the patient was much debilitated. The temperature fell at once after the operation.

July 9th.—As ordinary surgical remedies seemed to be useless, it was thought that it was worth making the experiment of treating the case by electricity. Cavity measures 4½ inches. 9th and 11th, 60 ma. for 5 minutes. There is less discharge, and the patient says that she feels stronger. 13th, 75 ma. 15th, 80 ma. 18th, 60 ma. 21st, 60 ma. for 5 minutes each. Is feeling so much stronger that she went out for a walk yesterday. 26th, 60 ma. for 5 minutes. Walked a mile. 28th, 60 ma. for 5 minutes.

August 16th, 40 ma. for 5 minutes. The temperature rose again to 102°, caused by a sloughing mass again protruding through the os. This was removed and the temperature fell. The sound was made positive to-day instead of negative, as it had been previously. 18th, 20th, and 23d, 40 ma. for 5 minutes.

September 8th, 40 ma. for 5 minutes. Sloughing mass was removed six days ago, and to-day the patient walked a mile both before and after the treatment. 10th and 13th, 60 ma. for 5 minutes. Says that she feels stronger than she has done for many years. 17th, 80 ma. 20th, 90 ma. 22d, 50 ma. 24th, 100 ma. for 5 minutes each. The cavity measures 3½ inches. 27th, 120 ma. 29th, 80 ma. for 5 minutes each. A clot the size of a walnut came away. This is the smallest that there has been. The uterus is now scarcely larger than normal.

October 1st, 4th, 6th, 8th, 11th, 13th, 18th, and 20th, 120 ma. for 5 minutes. Patient left hospital and reached home very comfortably. She was so well that people in the village crowded round her to see for themselves the change in her condition. She kept well for about two months; then wrote on the 27th December to say that she was not so well, and that the discharge had begun again. On the 12th January, 1888, she came back to the hospital. The tumor reached as high as the umbilicus, and the part projecting through the os was again sloughing. The temperature was 102.2.°

January 12th and 14th, 200 ma. for 5 minutes. A large mass came away yesterday. The sound was made negative. 17th, 260 ma. 19th, 275 ma. 21st, 260 ma. 26th, 160 ma. for 5 minutes each.

At first the patient improved, but now the intra-uterine mass has again begun to slough, and there is again fever. On account of the feverish condition the treatment had to be discontinued, as the Edinburgh Royal Infirmary was not provided with a suitable battery, and we did not have, at the time, a portable one. Toward the end of March, however, it was thought better to allow the patient to run the risk of going for the treatment, as we had arranged to leave Edinburgh.

March 22d, 100 ma. 24th, 125 ma. for 5 minutes each. The sound was again made positive. 27th, 210 ma. 29th, 150 ma. 31st, 170 ma. for 5 minutes each.

April 2d, 3d, and 5th, 170 ma. for 5 minutes.

There was decided improvement, and on leaving Edinburgh, Dr. Stirton, of the Glasgow Royal Infirmary, kindly consented to take charge of the case. After a few weeks in Glasgow she got homesick, and so anxious to get home that she risked the long journey, and died a few days afterward. What was the exact pathological condition it is impossible to say; it was certainly not the ordinary submucous fibroid condition, the material which was removed on several occasions resembling in appearance a mucous polypus more than anything else. It is not of much use to speculate on what might have been had things been different, but it is at least possible to believe that life, which was prolonged for six months or more by the electrical treatment, might have been permanently saved had the treatment in 1887 been continued for a greater length of time; that is to say, if the growth was not of a malignant nature.

Case V.—Married, age 42, was sent home by Dr. Turner, of Gibraltar, for hysterectomy. There is nothing of particular interest in the previous history of this case. For several years a fibroid of the uterus had been slowly undermining the general health, although there was neither hemorrhage nor any other of the usual symptoms an uterine fibroid gives rise to. She could not walk without the assistance of a stick in one hand and some one on the other side to help her along; but an extract from a letter of Dr. Turner's will give perhaps the best idea of her condition before the treatment was commenced: "I have to thank you for your kind note regarding Mrs. ——, and to express my great satisfaction that you have found her case possibly amenable to less hazardous treatment than the operation of extirpation. Her condition at one time, about three months ago, was such that her life seemed seriously threatened, and I doubted whether she would ever be able to stand a journey to England. I did not hesitate to recommend her undergoing the operation provided she got sufficiently well to travel. Before leaving Gibraltar she had improved considerably, and possibly the voyage home has done her good. I shall be most grateful if, by means of the electric current, you are able to stay the growth of the tumor, and enable Mrs. —— to tide over the few years that remain until the menopause."

The case did not appear to be a very suitable one for treat-

ment; but as every case of fibroid giving rise to symptoms had to be treated after the same plan, this one had to be taken like the rest.

The tumor extended to one inch above the umbilicus on the right side, and scarcely so high on the left. It came very low down into the pelvis, and the cervix was drawn up toward the left side and nearer to the pubes than usual.

Treatment.—As there was not any bleeding, the negative pole was placed in the uterine cavity and the current passed through from the abdomen. It was on every occasion badly borne, and even in the very weak doses which were used caused some pain. The strength of the currents used during the first course of treatment is only approximately correct.

July 9th and 11th, 1887, 40 ma. for 5 minutes. 12th, feels decidedly better and stronger. The tumor barely reaches up to the umbilicus, and the patient herself thought that she was smaller. 13th, 40 ma. for 5 minutes. 14th, slept last night in a dress, the band of which she could not fasten a week ago. 15th, 40 ma. for 5 minutes. Was able to take a walk without any support. 18th, 50 ma. for 5 minutes. 21st, the period has been on for two days. There was not any discomfort, although formerly she felt it coming for a week before it appeared. The tumor swelled up a little, but is now small again, and the patient says that her dresses are too wide. 26th, 40 ma. for 5 minutes. Walked two miles yesterday without fatigue. 28th and 30th, 40 ma. for 5 minutes.

August 1st and 6th, 50 ma. for 5 minutes. Feels splendidly well. The tumor is now fully 2 inches below the umbilicus, but it is also somewhat lower down in the pelvis. The abdominal wall is decidedly fatter. 8th, 11th, and 18th, 40 ma. for 5 minutes. There has not been any discomfort with the period; there has been less flow, and the patient feels perfectly well. The tumor is fully 3 inches below the umbilicus, and there is not so much of it in the pelvis. She looks a new woman.

On October 3d the patient wrote from Eastbourne that she was feeling very well, although she had required to keep her bed for some days while in London, as she had been much exhausted by the shaking of an hour's drive in a cab.

Had we known what we know now, we would never have thought of allowing this patient to go home, especially to

such a distance, after only thirteen applications, and we were not surprised to hear from Dr. Turner in June, 1888, that the tumor had begun to grow. She was very fairly well, but was afraid that she might return to the unhappy state from which electricity had rescued her. She therefore came back to England in the beginning of July.

July 3d, 1888.—Mrs. —— looks well, and walked alone from Victoria Station, about a mile. The tumor extends up to the umbilicus, and is not so large in the pelvis as it used to be. The sound passes with much greater ease than it did last year. 30 ma. for 5 minutes. 5th, 65 ma. 7th, 50 ma. 10th, 50 ma. 12th, 60 ma. 14th, 55 ma. 17th, 50 ma. 21st, 60 ma. for 5 minutes each. The period is just over, and there is a greater diminution in size of the tumor than this would naturally account for. 24th, 50 ma. 26th, 55 ma. 28th, 55 ma. 31st, 75 ma. for 5 minutes each.

August 2d, 75 ma. 4th, 70 ma. for 5 minutes each. The tumor is decidedly less, and the patient feels very well and strong. 6th, 60 ma. 11th, 50 ma. 14th, 70 ma. 21st, 70 ma. 23d, 90 ma. 25th, 65 ma. 27th, 85 ma. 29th, 95 ma. 31st, 105 ma. for 5 minutes each.

September 3d, 110 ma. 5th., 115 ma. 7th, 130 ma., for 5 minutes each. The tumor is 2 inches below the umbilicus, and is very much less prominent than it has ever been. 17th, 60 ma. 19th, 65 ma. 21st, 120 ma. 22d, 100 ma. 24th, 75 ma. for 5 minutes each. Yesterday was Sunday, and Mrs. —— was out for eleven hours; at church twice at least, and paying visits the rest of the time. 26th, 140 ma. 28th, 100 ma. 29th, 220 ma. for 5 minutes each.

The tumor is small—2 inches below the umbilicus—and the patient says that she is in perfect health.

Case VI.—Single, age 47, was seen in 1885 with a large uterine fibroid.

Patient was first aware that she had a tumor at about the age of 35, though before that time she found that her monthly periods were increasing in quantity. There is always pain, sometimes at one side, sometimes at the other, always aggravated every month. The periods, often floodings, now last six days, and recur every two weeks. For several years she has scarcely ever missed a month when it did not become necessary to afford relief to the bladder by means of the

catheter. The woman says that she is willing to run any risk, no matter how great, which would give her a chance of comfort. The appearance of the woman is peculiar, as her waist, or at least the part round which her petticoats are fastened, is situated immediately below her arm-pits. She has difficulty in getting about from the weight, and the legs are always swollen.

The tumor itself was large; it was slightly irregular, and extended beneath the ribs and sternum, raising them greatly. It is not possible to say how high the upper margin of the tumor reached to; but it really appeared that there would be little room in the chest for the thoracic organs. Within one inch of the vaginal outlet the finger came on a round smooth mass as hard as stone, which was jammed tightly in the pelvis. No cervix could be felt, and the finger could not be passed for any distance on account of the jamming of the tumor. The urethra measured 5 inches, and the bladder was situated high up on the left side of the abdomen. The retention of urine at the periods was easily explained, as it was evident that even slight swelling of the tumor would close the urethra by pressing it against the symphysis pubis. There was complete immobility of the tumor both in the abdomen and in the pelvis. The weight of the mass was probably nearer 40 than 30 pounds. After beginning the treatment of such growths by electricity, I called on the woman and suggested that she should try it, as it could hardly make her any worse than she was. She was sceptical, but allowed herself to be persuaded.

The electrical current could only be passed through the tumor by puncturing the mass in the pelvis. The negative pole was connected to this instrument. Owing to the occupation of the patient, the treatment was prolonged over many months. She had difficulty in getting away from her business. She was proprietress of a small shop, and she could not afford to get any one to look after it oftener than once a week or so. During the whole of the time she was not confined to her bed even for an hour, and was always to be seen in her shop, except for the hour or two when she left it to come for the treatment.

The strength of the current recorded at the first eighteen sittings is approximate only.

July 11th, 80 ma. 15th, 150 ma. for 5 minutes each. The patient feels much as she did; but the tumor seemed to be slightly movable. 19th, 90 ma. for 5 minutes. Says that she is no worse. 22d, 80 ma. for 5 minutes.

August 12th, 80 ma. for 5 minutes. She thinks that she can walk a little more easily. The period is over, and was much the same as usual; no better, and not any worse. There is now room to pass the finger up to the cervix. 16th, 40 ma. for 5 minutes. Walks more easily. The tumor is more movable, and is smaller and more lobulated. 20th, 40 ma. for 5 minutes. 28th, the period came on without any pain; there was more bleeding, and the catheter had not to be used. This has been the most easy time for many years.

September 2d, 45 ma. for 7 minutes. 5th, 40 ma. 13th, 40 ma. 20th, 40 ma. for 7½ minutes each. There is now marked decrease in the size of the tumor. 26th, 40 ma. for 7½ minutes.

October 17th, 40 ma. for 7½ minutes. There was much less flow this time; it was bad for one day only. However, the catheter was required. The tumor is now free of the ribs. 24th, 60 ma. for 5 minutes.

November 9th, 70 ma. for 7½ minutes. There has been rather more flow again, but the catheter was not required. The tumor continues to diminish in size; it can be pushed about, and has become very much lobulated. 16th, 40 ma. 24th, 40 ma. 30th, 70 ma. for 7½ minutes each.

January 16th, 1888, 125 ma. for 10 minutes. The period was passed through without pain, discomfort, or retention. 26th, 150 ma. for 5 minutes.

February 7th, 100 ma. for 5 minutes.

March 26th, 100 ma. 29th, 150 ma. 31st, 150 ma. for 8 minutes each.

April 2d, 150 ma. 4th, 150 ma. 6th, 150 ma. for 5 minutes each. The course of treatment thus consisted of thirty applications. Thirty punctures were made into the tumor from the vagina. On one occasion only was there any bleeding from the wound; it stopped, however, before half a teaspoonful of blood had been lost. Every puncture opening had healed before another was made, and it would have been impossible for any one to know that there had been any solution of continuity.

For the reason stated, the treatment extended over a

period of nine months. Almost from the beginning there was improvement, and during the whole time there had been retention on only two occasions. The floodings had entirely ceased, and the tumor had decreased in size in a marked degree. Owing to the fact that a large part of the tumor was concealed by the chest-wall, it is difficult to say by how much the mass became smaller; but probably it was considerably less than half the size it was before being treated by electricity. A complete relief from pain had also been obtained. In September she was very well; there was not any pain, there was less discharge at the periods, and there had been no occasion for the use of the catheter. The tumor was about the same size as in April.

January 19th, 1889.—The tumor is gradually becoming smaller, and there is a great change for the better in the figure. The periods last three days, and recur every four weeks; there is not any pain; there has not been any retention; she feels quite well, and sleeps better than she used to do, and is quite satisfied, even although there is still an inert mass in her abdomen.

Case VII.—Single, age 37.

Until the beginning of the year 1882 this lady was well. About that time she began to have menstrual trouble; there was pain and also increased loss. For three and a half years these symptoms became steadily worse, and for a week or ten days in every month the lady was in the habit of leaving her own house and going to a sort of private hospital. She herself was mainly responsible for her troubles, as she allowed that she had declined having anything done.

When she came under our care in July, 1887, she was really ill and was constantly suffering. There was a feeling of fulness, great irritability of the stomach, profuse watery discharge, and great pain and feeling of pressure on the bladder. In addition, there was a great loss at the periods, and at those times all the symptoms were much aggravated, more especially the bladder pain and the irritability of the stomach.

On examination it was found that the tumor reached up to the ribs, and on passing the finger into the vagina, it was felt within half an inch of the outlet. The mass was particularly soft, and so completely filled the pelvis that the finger could not be passed up any distance to feel for the lips of the

fully dilated cervix. The vaginal outlet was small, and enucleation of a mass, weighing probably ten pounds, would have been attended by great danger, more especially as the anterior wall of the uterus was found, later on, to be much thinned.

The patient was very much against operation, and was thankful to try what electricity could do for her tumor, though she was made aware that no benefit might accrue from the treatment. Of course, it was only possible to puncture the mass. On all occasions this was done and the needle made negative.

July 13th, 1887, 60 ma. 15th, 80 ma. for 5 minutes each. There was not any discomfort after the first application, except that there has been more of the watery discharge. 18th, 60 ma. 20th, 65 ma. 22d, 75 ma. for 8 minutes each. 24th, the period has come on with the usual retention and pain. The ordinary dose of morphia required by the patient at those times, viz., three-quarters of a grain hypodermically, has been required.

August 8th, 60 ma. for 5 minutes. 11th, 80 ma. for 8 minutes. 13th, 100 ma. for 5 minutes. The pelvis does not seem to be so tightly filled by the tumor. 16th and 25th, 60 ma. for 8 minutes. Morphia was required as usual at the commencement of the period, but the catheter had not to be used. 27th, 120 ma. 30th, 100 ma. for 8 minutes each.

September 1st, 80 ma. for 8 minutes. 3d, 100 ma. for 10 minutes. 17th, 50 ma. for 5 minutes. There was not so much pain as usual. The tumor is now scarcely above the umbilicus, and the finger can be pushed up between the pelvis and tumor, until the anterior lip of the cervix is reached, situated in the abdomen above the pubes. 20th, 80 ma. 22d, 120 ma. 24th, 110 ma. for 5 minutes each. 27th and 29th, 120 ma. for 7 minutes. Is feeling more comfortable and lighter.

October 1st, 120 ma. for 5 minutes. 11th, 120 ma. for 7 minutes. The period has been very much as usual. 13th, 15th, 18th, 20th, 22d, and 25th, 120 ma. for 7 minutes.

November 3d, 5th, and 8th, 120 ma. for 7 minutes. 10th, 12th, and 15th, 120 ma. for 15 minutes.

December 3d, 200 ma. for 7 minutes. The period was scarcely so bad as usual, and the patient was in bed for three days only. Gaiffe's galvanometer was used. 6th, 180 ma. for 10 minutes. 8th, 230 ma. 10th, 190 ma. for 15 minutes

each. 13th, 215 ma. for 12 minutes. 14th, 245 ma. for 15 minutes. 31st, 200 ma. for 10 minutes.

January 3d, 1888, 210 ma. for 15 minutes. 5th, 150 ma. 7th, 200 ma. for 10 minutes each.

February 22d, 175 ma. for 5 minutes. Has been confined to the house with a cold. 24th, 200 ma. 27th, 175 ma. 29th, 150 ma. for 5 minutes each.

March 2d, 120 ma. for 5 minutes. 5th, 150 ma. for 8 minutes. The tumor is at least one-third smaller, and reaches up to the umbilicus when it is swelled before a period. We considered that we had probably gained as much as we could by means of electricity, and that both the difficulty and danger of operation had been much lessened. The lady could not make up her mind to have an operation at that time. She came up to town in June, and we found that there had not been any change in the tumor since March. After a couple of days in town her courage went, and she had almost to be coerced into submitting to enucleation.

June 7th, the tumor, weighing almost five pounds, was removed piecemeal, and the lady went home to Edinburgh on the twenty-second day.

This case bears out to the letter what is claimed for electricity: it reduces, but does not cause the disappearance of a tumor.

Case VIII.—Married, age 48, seen with Dr. Dunsmure.

This lady has been bleeding badly for twenty years. She has often been plugged; she has often had iron and various other styptics injected, but still she bleeds; and in spite of all treatment the bleeding and general health become worse every year. There is now scarcely any period, as the bleeding is almost continuous.

The patient is a big, fat, soft woman, very anæmic and breathless. Her heart is in a bad condition; it is dilated and fatty, and the purple venous radicles in her cheeks show that it is not able to do its work properly. She is also subject to attacks of diarrhœa. She is very weak, and altogether in a bad state. As there was not any sign that the bleeding would stop of itself, it was determined to commence the treatment without delay, as every day seemed to be of importance The lady was much disappointed when she heard that the treatment could not be carried out in her own house. The strength of the current registered is not exact.

The patient was so fat that it was difficult to make out the upper margin of the tumor, more especially as any pressure on the abdomen interfered with her breathing. The os was patulous, and the sound passed to a depth of six inches.

July 14th, 1887, 100 ma. for 7½ minutes. 16th, 100 ma. 19th, 65 ma. for 5 minutes each. 21st, 80 ma. for 10 minutes. There has not been any bleeding for two days, the first time it has stopped for the last twelve weeks. 23d, 40 ma. 25th, 60 ma. 27th, 60 ma. for 10 minutes each. There has been no return of the bleeding. 29th, a message was sent to say that the patient was unable to come for treatment, as she had caught cold while out driving the day before, and had been seized with a bad attack of diarrhœa during the night. 30th, Mrs. C. became collapsed, and died early this morning. It was a great disappointment, as the case promised to be a most satisfactory one, and but for the attack of diarrhœa would doubtless, in spite of the great exhaustion and anæmia, have done well.

Case IX.—Married, age 43; commenced the treatment by electricity in July, 1887.

In February, 1886, Dr. Keith was consulted as to the advisability of operation, and strongly advised the patient to wait for a time, as the local difficulty in the removal of the tumor would have been great. There were about 4 inches of fat on the abdominal wall, and a great deal of enucleation would have been required low down in the pelvis. If the tumor grew, operation would have been much more easy, as the wall would have been stretched, and there would therefore be more space to work in. The patient herself was very anxious to have something done.

Some extracts from a diary kept by this lady give one an idea of her misery. One entry says, "Quite a busy week; out shopping; feel so thankful to be able to move about." The next day, however, she is in bed again. Another, "Only seven days—how thankful I am."

June 18th, 1886.—"I feel miserable. A burden to myself, and no use to anybody."

The lady was stout and very anæmic, and, when well, was unable to walk far on account of breathlessness. She says that she often bleeds for a month at a time, and is seldom dry for more than a week. The tumor extends up to the ribs,

and fills the abdomen except in the left flank. The interior of the cavity was tender, and the passage of the sound caused pain until about half of the treatment had been gone through. The depth of the cavity was 7 inches at least.

The case was an instructive one to a beginner. The patient was, after the first few applications, extremely sensitive to the electrical current, and it was not until the treatment was almost finished that anything approaching large doses were given. During the first four sittings the sound was made negative; during the remainder it was positive.

July 14th, 16th, and 25th, 80 ma. for 5 minutes. The period is over, and as the flow was profuse for only three days, the lady, who is a woman full of spirits, thinks that she is to be quickly well. 28th, 80 ma. for 5 minutes.

August 11th, 80 ma. for 5 minutes. After an interval of one week the flow appeared, and the loss has been greater than it has been for the past eight months. 13th, 70 ma. 16th, 40 ma. for 5 minutes each. The tumor scarcely reaches above the umbilicus and the patient feels very well. 25th, 40 ma. for 5 minutes. The third period within less than six weeks is over. There was scarcely as much bleeding as last time, but still it has been bad. The tumor is swelled up to within an inch of the ribs. 27th, 40 ma. for 5 minutes. Two days afterward the period again came on, for the fourth time in exactly six weeks. The lady and her husband are both much discouraged, and are rather inclined to stop treatment; and the matter is to be compromised by her going to the country for a month.

October 6th, 40 ma. for 5 minutes. The patient is decidedly better. The last period continued for five, instead of the average of thirteen days. The tumor is not so prominent. 8th and 11th, 40 ma. for 5 minutes. The patient says that she feels "awfully well." 13th and 15th, 35 ma. for 5 minutes. 17th and 19th, 30 ma. for 5 minutes. 22d, 35 ma. 24th, 40 ma. for 5 minutes each. 26th, 28th, and 31st, 40 ma. for 7 minutes.

November 2d and 15th, 40 ma. for 7 minutes. The first period since the lady came home from the country is over. It did not appear until ten days beyond four weeks, lasted six days, and was never in excess of the natural. 17th and 19th, 70 ma. for 7 minutes. 22d, 70 ma. 24th, 75 ma. for 10 minutes each. 26th, 30 ma. for 7 minutes. Gaiffe's galvanometer was used to-day. 29th, 75 ma. for 10 minutes.

December 1st, 65 ma. 3d, 85 ma. 6th, 75 ma. 15th, 100 ma. for 10 minutes each. The period has lasted five days, and was bad for two. 17th, 100 ma. 20th, 125 ma. 22d, 125 ma. 24th, 140 ma. 27th, 140 ma. 29th, 125 ma. for 10 minutes each.

January 10th, 1888, 170 ma. for 10 minutes. The period has lasted six days; three of them bad. 12th, 165 ma. 14th, 160 ma. 17th, 170 ma. for 10 minutes each.

There was rather a bad hemorrhage in the end of March.

In August the lady was in town; she was up for a month, and had taken her daughter, a girl of 12 or 13, everywhere—British Museum, Tower, Crystal Palace, etc., etc. She was perfectly well, and the period had recurred regularly every two months, and had lasted three days. One day this lady said that she had only submitted to the treatment by electricity, because, when the treatment failed as she expected it would do, she then thought that she would be operated upon.

February 29th, 1888.—"I have had such a good time this month. Been ill only three days, and had only one day very bad, and a very happy woman is writing to you. I am feeling very well and strong, and so hopeful."

December 11th, 1888.—"I am sure that you will be glad to hear that I am in the best of health. I have never been a day in bed since you saw me there yourself, just before you left for London. I am only two days bad now, and so little in quantity that I require to take no rest, and move about all the time. What a change to what used to be, and how delightful it is! I never in my most sanguine moments thought I would be so well."

June 10th, 1889.—"I am very thankful to tell you that I am keeping well and strong. From August last till February I was just one day 'poorly' regularly every month, and was awfully well. But since then I have had no period at all. I can do any amount of walking, etc."

Case X.—Single, age 37, was sent by Dr. Underhill, and was treated at the Woman's Dispensary, Edinburgh.

Patient has not been strong for a number of years, and has lost a great deal of blood at her periods for a long time. The bleeding now usually lasts two weeks out of every four. About the beginning of the year she noticed that there was a lump in her abdomen; but was not sent to Dr. Underhill on

account of that, but because she was complaining much more than usual of pain and discomfort across the lower part of the abdomen and down the legs. Dr. Underhill had seen the rapid improvement in health which had come to Case V. after even a few applications of electricity, and considered that this would be a satisfactory test case on account of the hemorrhage, pain, and increasing debility.

On examination, a hard, smooth tumor, situated centrally in the abdomen, was felt extending to within 2 inches of the umbilicus. The cervix was situated very far back and low down in the pelvis, and it was with some difficulty that the sound passed to a depth of 3 inches.

As this was one of the early cases, few applications were made, and even these few were not very strong, the exact strength being a little doubtful.

July 22d, 26th, and 29th, 1887, 50 ma. for 5 minutes. There is already less pain, and the patient feels stronger. The tumor has begun to decrease in size.

August 16th, 50 ma. for 5 minutes. She feels decidedly better; there is less pain, little discomfort, and there is a marked diminution in the size of the growth, more especially at the sides. There has been a very easy period, lasting seven days, during which there was much less discharge than usual. 20th, 50 ma. for 5 minutes.

September 5th, 40 ma. for 5 minutes. As there had been another period, accompanied by more loss and pain, the sound was attached to the positive instead of the negative pole, as had been done in the five previous applications. 8th, 40 ma. 13th, 60 ma. 20th, 70 ma. for 5 minutes each.

October 7th, 60 ma. for 5 minutes. The tumor is probably not half the size it was six weeks ago. It extends now to 2 inches above the pubes. 20th, 28th, and 31st, 60 ma. for 5 minutes.

November 4th, 70 ma. for 5 minutes. The tumor can now be felt one inch above the pubes and entirely to the left of the middle line.

February 9th, 1888.—Has been very well. There is not any pain, there is very much less loss at the periods, and on pressing deeply into the abdomen, no vestige of tumor can be felt.

April 6th, called to-day to say that she was quite well.

Case XI.—Single, age 26, was sent to the Royal Infirmary, Edinburgh, by Dr. Wilson, of Old Meldrum, in July, 1887.

The patient was a tall, nice-looking girl, but terribly blanched and bloodless. For rather more than two years there had been a great loss of blood at every menstrual period. Now, the flow lasts for ten or twelve days, and is usually accompanied by severe pain. For the last eight months hypodermic injections of ergot have been given once and sometimes twice a week, and relief from pain has had often to be obtained by the use of morphia suppositories.

On first examination, the tumor was found to extend to midway between the pubes and umbilicus, and before the period, it reached up to the umbilicus. The cervix was situated far back; and in front of it and pressing down on the bladder was a mass of tumor. The sound passed 4½ inches.

July 30th, 1887.—60 ma. for 5 minutes.

August 1st, 80 ma. for 5 minutes. The period, which was over before the first application on 30th July, having lasted twelve days, returned on the 3d August, and the bleeding continued for ten days. 16th, 40 ma. 18th, 60 ma. 20th, 60 ma. 23d, 60 ma. 25th, 60 ma. 27th, 80 ma. for 5 minutes each. The tumor has been becoming steadily smaller, and is now less, the patient says, than when first noticed. 30th, 50 ma. for 5 minutes.

September 1st, 80 ma. for 5 minutes. For two years the patient has not felt so well and strong as she does to-day. She looks immensely better than she did a month ago. 3d, 6th, and 8th, 80 ma. for 5 minutes. On deep pressure the top of the tumor can be felt with difficulty from the abdomen. 10th, 80 ma. for 5 minutes. There was a little red discharge for a few hours yesterday. 13th, 80 ma. 17th, 80 ma. 20th, 70 ma. for 5 minutes each.

With the exception of a slight "show" for a few hours, there had been no hemorrhage from the uterus for nearly six weeks, and the patient was allowed to go home. Shortly after going home she wrote to say that she had had a very severe bleeding. Some time after that she wrote that she was much better; but as she was steadily losing ground, by the beginning of 1888 she was to come back to the hospital for more of the treatment, experience having shown that she had had neither strong enough doses nor enough of them. Our

removal from Edinburgh prevented further treatment, and about September, 1888, it appears that her ovaries were removed by a gentleman, who at that time advised, strangely enough, treatment by electricity to several patients, who eventually came south for it.

The exact strength of current used was doubtful.

Case XII.—Married, age 48, came to the Woman's Dispensary, Edinburgh, in June, 1887.

Married for twenty-six years, and the mother of eight children, the youngest being 11 years of age. She does not remember when she first began to be ill, but says that it is a number of years ago. She suffers from constant bearing-down pain, which prevents her walking more than a very short distance at a time, and from general debility, which prevents her attending to her house. She is frequently so used up by 12 o'clock that she has to go to bed for the rest of the day. Menstruation is now very irregular, and occurs every few months.

On passing the finger into the vagina, it was found that the whole of the pelvis was filled by a tumor. The cervix uteri, of large size and deeply lacerated on both sides, was situated behind and close to the pubes, and the sound passed backward with a very much exaggerated curve to a depth of 3¾ inches. Had the cervix not been torn the length of the womb would have been about 5 inches. The fibroid was so large and so firmly fixed in the pelvis, that it could not be raised either by pushing up with the fingers or with the sound. Some little temporary relief was given by raising it slightly by means of glycerin pads.

Treatment by electricity was begun on the 8th August, 1887. The sound attached to the negative pole was passed into the uterine cavity, and a current of about 50 ma. allowed to flow for five minutes. The patient did not know that anything special was being done, and thought it a long examination! The treatment was repeated on the 19th. In the mean time there had been some bleeding; but the woman felt better and lighter, and had eaten her breakfast with more relish than she had done for a long time. Applications were made on the 28th, on the 9th and 23d September, and on the 14th, 21st, 24th, and 31st October—the direction of the current being reversed in the last five. After the second there was

decided diminution in size of the tumor. After the sixth, I was able to raise the mass out of the pelvis into the abdomen with the sound, though it dropped back again as soon as the instrument was removed. Nothing was seen of this patient until the 20th January, 1888. In the interval she had, in addition to doing her housework, nursed her daughter through a bad attack of double pneumonia following rheumatic fever, which had left the heart in a shaky condition.

January 20th, 65 ma. 27th, 155 ma. for 5 minutes each.

To-day the uterus was found to have left its position of retroversion. It now extended from 3 inches above the pubes to the vaginal outlet. The treatment consisted in eleven applications—four negative and seven positive. The primary result was that she became such a busy woman that she did not have time to come for more treatment, as I wished.

In September she was very well.

January 19th, 1889.—Almost one year from the date of the last application she was in perfect health, except for a slight occasional feeling of weakness across the stomach; able to do all her work, and to walk as far as she ever wished to walk. She has still periods occasionally as before.

Case XIII.—Married, age 47; was sent by Dr. Ross, of Belfast.

For three years this lady has been an invalid. She cannot move, even while in bed, without setting up great pain in the pelvis. She can scarcely walk, and she finds that standing is worse than anything else. Menorrhagia is also a prominent symptom.

Examination is difficult, on account of great tenderness, but the pelvis is found to be almost filled with tumor, or tumor combined with surrounding cellular swelling. The sound passes backward for between 3 and 4 inches.

The treatment was carried out before we had Gaiffe's galvanometer.

August 13th and 15th, 1887, 40 ma. for 5 minutes. Was very tired after the first application; but thinks that she already feels a little better. 17th, 40 ma. 19th, 50 ma. for 5 minutes each. Says that she is decidedly better to-day. 22d and 24th, 50 ma. for 5 minutes.

September 3d, 40 ma. for 5 minutes. There has been rather less flow than usual, and there has been a vast improvement

in comfort, comparatively little pain, and freedom to walk about a little. 5th, 40 ma. for 5 minutes. Walked fully half a mile to-day. 7th, 40 ma. for 5 minutes. To-day she does not feel so well. 9th, 40 ma. 12th, 50 ma. 14th, 50 ma. for 5 minutes each. Says that she feels "tip-top," and is in such spirits that she had to be strongly warned to be careful. 29th, 80 ma. for 5 minutes. There has been less discharge, though the lady has been walking about every day. She can stand now with perfect comfort, and without bringing on pain.

October 1st, 85 ma. 3d, 70 ma. for 5 minutes each. The sound was always made positive. Is now quite well, and walked a mile. The cavity measured 2½ inches. 7th.—"I left Edinburgh on Tuesday, and arrived at Stranraer, Wednesday. I was up before six to catch the boat, took two of the cocaine lozenges, which were of such use to me. I was not ill. My 'period' came on that morning, so I felt most thankful I got on so well. I arrived here (Belfast) at half-past eight last evening, and feel wonderfully well to-day. Dr. Ross was much pleased with my looks and progress. Your treatment has been of great use to me."

February 13th, 1888.—"I feel so much better than I did last winter."

Dr. Ross wrote on the 10th June, 1889: "I made a vaginal examination, and the change for the better in and around the uterus is remarkable; in fact, I could find nothing amiss except an elongated cervix. The abdominal swelling has also greatly subsided, and with this improvement in the physical signs, the general is as great. Severe hemorrhage ceased, and she can now walk about. Both she and I consider truly that her case is a triumph for electricity."

Case XIV.—Married, age 36, was admitted into the special ward for the treatment of abdominal tumors in the Royal Infirmary, Edinburgh, in August, 1887.

The patient was the mother of five children, the youngest of whom was fifteen months old. These had all been born without aid, after tedious labors. Of three sisters one has suffered from profuse discharge every month, and was becoming so much run down that she was advised by Mrs. —— to come home for the same treatment which she herself had undergone. As this meant a journey from China, it shows very clearly how much benefit this patient had derived from

her treatment by electricity. However, the change of air to Formosa did wonders, and there is at present no necessity to come further.

Mrs. —— had enjoyed good health until about the beginning of the year. In February she was admitted into one of the medical wards of the Royal Infirmary on account of an attack of inflammation (?). While there the tumor was discovered; it was said to have been pronounced to be cystic, and operation was strongly advised. After a residence of five or six weeks she went home, and while there was visited by the house physician, who had been sent to try and persuade her to allow the tumor to be removed. This was, however, declined. When she was admitted under our care she complained of abdominal pain, of a feeling of dragging from the back, of difficulty in walking, and of being easily fatigued. There is also very great pain every month. There was no increase in menstruation, but the tumor had been noticed to swell up before the flow came on.

On examining the abdomen, the tumor was found to be situated rather more on the right than the left side, it reached to midway between the pubes and the umbilicus, and it could be moved a little in any direction. But there could be no doubt but that it was an ordinary fibroid tumor of the uterus. The cervix was in the usual situation, and the sound entered fully $3\frac{1}{4}$ inches.

The treatment consisted in thirteen negative applications, the strength of the currents recorded being not absolutely correct.

August 16th, 40 ma. 18th, 60 ma. 20th, 60 ma. for 5 minutes each. She now walks much better and feels stronger in every way. 30th, 80 ma. for 5 minutes.

September 1st, 60 ma. for 5 minutes. Was very tired after the last sitting, and complains of frontal headache. 3d, 10th, and 13th, 60 ma. for 5 minutes. The headache gave way to a few doses of iodide of potassium, and the patient thinks that she is nearly well. 17th, 50 ma. 20th, 60 ma. 22d, 60 ma. 24th, 60 ma. 27th, 50 ma. for 5 minutes each. She feels quite well, and the treatment will now be stopped. Indeed, it has been difficult to persuade her to come as often as she has.

February 26th, 1888.—Is in perfect health, and the tumor feels to the patient to be the size of a small egg.

September, 1888.—The general health continues to be good, but she is easily fatigued, and sometimes thinks that the tumor is larger.

January 19th, 1889.—Sixteen months after the cessation of the treatment she says, "I am as well as I have any desire to be." She can walk well and without undue fatigue; there is not any dysmenorrhœa; no pain in the abdomen, and the dragging from the back is a thing of the past.

Case XV.—Married, age 34, was sent by Dr. Wemyss, of Broughty-Ferry.

This patient had been married for a number of years, and had enjoyed good health until the early part of 1885. The commencement of her illness is somewhat unusual. Without there being anything to cause or account for it, the lady vomited a large quantity of blood. This occurred at the time of the period, and appeared to have replaced it, as the usual discharge from the uterus did not come on. From that time there has been more or less pelvic discomfort and pain. There is not any menorrhagia; indeed, there is less blood than there used to be, but it is accompanied by a profuse watery discharge. Dr. Wemyss sent her first in October, 1885. At that time she was advised to wait and do nothing. At her next visit the same advice was given. When she came for the third time, however, the tumor was decidedly larger, and was causing more discomfort. She was advised to have the ovaries removed, and was to come back to have the operation when it was convenient to her. But, when she returned in August, we had given up operating on fibroids. For about a week out of every month the patient is fit for little; something had to be done.

On examination, it was found that the uterus was pushed forward by a mass filling the hollow of the sacrum. The sound passed forward to a depth of $4\frac{1}{4}$ inches, and the uterus could be moved almost independently of the mass of tumor.

The treatment consisted in sixteen applications of electricity, the clay pad being made positive and the sound or puncturing needle negative.

August 22d, 1887, 40 ma. 24th, 40 ma. 26th, 50 ma. 29th, 70 ma. for 5 minutes each.

September 3d, 60 ma. for 5 minutes. The mass was punctured to-day, and the passage of the electrical current gave

rise to less discomfort. There has been a period, which caused much less pain and disturbance, and was accompanied by less watery discharge. 6th and 8th, 40 ma. for 5 minutes. 10th, 60 ma. for 7 minutes. There is a marked improvement; the lady walks better, and finds her left leg, which has been a source of trouble to her for a long time, much more comfortable and less painful. 13th, 40 ma. for 7 minutes. A puncture was made to-day for the second time. The patient says that she feels almost quite well. 15th, 40 ma. for 5 minutes. The mass, which was previously as large as the fist, feels now not half the size. 17th, 50 ma. 20th, 60 ma. for 5 minutes each. 22d, 70 ma. for 7 minutes. 24th, 27th, and 29th, 50 ma. for 7 minutes. Says that she is perfectly well. The uterine cavity is one inch shorter than it was.

Dr. Wemyss wrote on 21st October, 1888: "Mrs. —— keeps very well. She is in excellent health, and the tumor feels very much the same in size. The sound can only be inserted about 3 inches."

Case XVI.—Married, age 37; from Dr. Wilson, Johnston, Renfrewshire; consulted Dr. Keith in August, 1887.

At the age of 23 she was married, and enjoyed good health for twelve years. Two years ago she began to lose too much blood every month, and a year after, a tumor was discovered on examination, which was made after a severe flooding. Since that time she says she has flooded nearly every month, and that the tumor has increased very markedly in size. Before each menstrual period it had been noted that the tumor became considerably swelled. Of late she has become breathless and unable to do much.

The patient, a big, soft, flabby woman, is very bloodless. On examining the abdomen a tumor could be both seen and felt, occupying the right side of the abdomen, crossing the middle line to the left and filling half that side. Its upper margin was level with the umbilicus. There was some very considerable difficulty in passing the sound on account of the irregularity of the cavity, which measured 4½ inches in depth. The diagnosis was, of course, evident.

This was a case for the application of the positive pole to the interior of the uterus, and the treatment was begun on

August 22d and 25th, 1887, 40 ma. for 5 minutes. She was

very tired in the afternoon after the first application. 27th, 40 ma. for 5 minutes. She feels better than she has done for the past eighteen months, and there is a decided decrease in the size of the tumor. 30th, 40 ma. for 5 minutes.

September 1st, 40 ma. for 5 minutes. Feels very well, except for a frontal headache, which was, however, quickly relieved by iodide of potassium. 3d, 5th, and 17th, 40 ma. for 5 minutes. The period is over. The loss has been very much less than usual, though still much more than it ought to be. The patient feels better than usual, and the tumor swelled up but little. 20th, 40 ma. 22d, 80 ma. 24th, 60 ma. for 5 minutes each. 28th, 120 ma. for 7½ minutes.

October 1st, 60 ma. for 5 minutes. The tumor reached to barely 2 inches above the pubes on the right side. There is now nothing to be felt on the left. The cavity measures 2¾ inches. In the general health there is a marked improvement, and the patient says that she now feels as well as she was before she first began to be ill.

Case XVII.—Married, age 30; was sent to the Edinburgh Royal Infirmary by Dr. Whiteford, of Greenock.

The history of this patient was as follows:—She had been married for ten years, and had known of the presence of a lump in her abdomen for five years. As this did not give rise to any inconvenience, the woman never thought of consulting a doctor until she began to be ill. The form the illness took was simply that she became unable to do anything for debility, due to excessive loss of blood at every menstrual period. She now bleeds for from ten to fourteen days at a time, and then has an interval of two or three weeks. This has been going on for the last two or three years.

She is seen to be ghostly white, her face, lips, and eyelids are absolutely colorless, and she can scarcely get about from weakness: even to cross a room requires a great effort on her part. A year ago she was a patient in the Greenock Infirmary for three months. She had a great deal of medicine while there, and says that she was told that she could not live long, and that nothing more than had been done could be tried in her case. Dr. Whiteford give her ergot, and this drug was the only one she had had which checked the hemorrhage in the slightest degree.

On examining the abdomen a hard, smooth, very promi-

nent tumor, extending to one inch above the umbilicus, and entirely filling the abdomen up to that level, was felt. The cervix was very far back, and the sound passed 5 inches into the cavity of the womb.

The woman was very poor, and for a long time her food had consisted mostly of bread and tea, and even when there was anything better in the house, she did not feel able for the exertion of cooking it. Bread and tea cannot be a very good blood-making diet, yet it is wonderful how she managed to have so much blood to lose and yet be alive.

The exact strength of the current passed through the tumor is doubtful in the first six and twenty applications. As the period came on the day after she came into hospital, and lasted for fourteen days, the treatment was not begun until August 25th, 1887, 60 ma. for 5 minutes. 27th, 80 ma. for 9 minutes. Was very tired after the first application. 30th, 80 ma. for 7 minutes. She is surprised to find that she can walk more easily.

September 1st, 80 ma. for 5 minutes. The tumor is decidedly smaller. Patient has begun to take Blaud's pills. 3d, 6th, 8th, and 10th, 80 ma. for 5 minutes. Can now walk two miles with ease, and says that she has not been so well nor has walked so far for the last two and a half years. 13th, 80 ma. for 5 minutes. Yesterday the tumor had swelled considerably, but is smaller again to-day. 15th, 100 ma. 17th, 90 ma. for 5 minutes each. To-day she remarked that she would be quite happy if she kept as well as she now is. 20th, 120 ma. 29th, 105 ma. for 5 minutes each. The first period since the commencement of the treatment is over; it lasted five days instead of, at least, ten, and although the flow of blood was pretty brisk while it did last, she does not feel much pulled down, and has immensely more color than when she first came to Edinburgh.

October 1st, 120 ma. for 5 minutes. Until now the positive has been the internal electrode. At the next seven the negative was used inside the cavity. 4th, 100 ma. 6th, 120 ma. 8th, 120 ma. for 5 minutes each. Yesterday the patient went to Leith and walked along the pier. She was out the whole of the afternoon, and must have walked at least five miles. 11th, 13th, 15th, and 27th, 120 ma. for 5 minutes. The second period is over; the quantity of blood lost has been much the same as

the last time. As there was a slight return of the flow of blood from the uterus after the last sitting, the direction of the current was again changed in the following ten applications. 29th, 120 ma. for 5 minutes.

November 1st, 3d, 5th, and 8th, 120 ma. for 5 minutes. The patient went to the Convalescent Home at Costorphine. While there the flow came on; it lasted for six days, and was immensely less than it had been for a very long time, yet the people at the Home were quite alarmed at the amount.

December 1st, 135 ma. for 5 minutes. 2d, 240 ma. for 8 minutes. 6th, 200 ma. for 10 minutes. 8th, 190 ma. for 10 minutes. 10th, 205 ma. for 10 minutes. The tumor is now one-third less in size than it was, and instead of being smooth has become irregular in outline. There has been a large deposit of fat on the abdominal wall. The period came on after this application, and the amount of blood lost was fully more than at the last three, yet the woman does not feel at all the worse for it. 24th, 230 ma. 26th, 240 ma. 28th, 240 ma. 30th, 235 ma. for 10 minutes each.

January 3d, 1888, 230 ma. for 10 minutes. The treatment consisted in thirty-six applications—twenty-four positive and twelve negative—and the patient left hospital a well woman.

There are several points of interest about this case. It cannot be said that the comfort and rest of the hospital had anything to do with her recovery, as she had had the same comfort and rest while in the Greenock Hospital. It would also be expected that a change from the low diet of tea and bread to the ordinary hospital fare would have resulted in an increased flow of blood, more especially as the improved diet was accompanied, almost from the beginning, by the administration of a regular course of iron pills. The woman was also sensible enough not to be distressed by the presence of a tumor which did not give rise to any symptoms; and again to consider herself cured when her tumor had, after having been an active agent for evil, become quieted down and had ceased to give rise to symptoms.

In March Dr. Whiteford reported that the patient was very well.

Dr. Whiteford kindly sent the following report on 13th March, 1889: Monthly period now lasts six or seven days, as compared with four or five immediately after treatment and

for six months thereafter. Still does not lose, withal, so much as formerly, but has more pain (pelvic) now at the time. The quantity lost during any one day has been gradually lessening during the last four or five months, but lasts two days longer. The tumor has increased in size toward the left side (this is her own opinion, and from my recollection I think this is probably true). Slight anæmic murmur in right jugular, but lips rosy in color, and looks fairly well.

Case XVIII.—Married, age 46; had been fragile and delicate for a number of years. She thinks that she has at all times lost more blood at the monthly periods than she could afford, and in the interval there is a constant leucorrhœal discharge. In addition to this she suffers from severe pelvic pains. Treatment has never done her more than very temporary good. The interior of the womb was curetted on three occasions, and was followed by some improvement for a time.

The uterine cavity measured four inches. Eleven applications of electricity were made in 1887, the internal electrode being positive. Seven additional applications were made in 1888.

August 26th, 1887, 70 ma. for 5 minutes.

September 2d, 40 ma. for 5 minutes. The first sitting was followed by a very considerable increase in the amount of pain, and it also brought on bleeding, which has lasted until to-day. 5th, 40 ma. for 5 minutes. There has been less pain during the last two days. 8th, 60 ma. for 5 minutes. To-day the patient does not feel so well; but the passage of the electrical current did not give rise to as much pain as it has done before. 14th, 40 ma. for 5 minutes. The amount of pain which there has been during this menstrual flow has been the same as usual, but the quantity of hemorrhage was not greater during the whole time than it often has been in a single day. 16th, 19th, and 21st, 40 ma. for 5 minutes. Is now feeling better, and says that her nerves are stronger, and does not now start when a door bangs or such like. 23d, 40 ma. 28th, 120 ma. for 5 minutes each.

October 5th, 120 ma. for 5 minutes. Feels so much better that she thinks that she can stop all treatment.

March 23d, 1888.—Until a few weeks ago the lady felt very well; but hearing that we were leaving Edinburgh, she was very anxious to have a few more applications, as she says that

she feels that this is the only treatment which has really ever done her any good. 25th, 120 ma. 26th, 180 ma. 27th, 145 ma. 28th, 150 ma. 30th, 120 ma. 31st, 115 ma. for 7 minutes each.

April 2d, 120 ma. for 7 minutes. Gaiffe's galvanometer was used to measure the strength of the current at this time. Owing to necessity, the treatment, consisting of seven applications, was made in eight days; the strength of the current was greater, and the length of time of each application longer, and, just at first, was a little too much for the patient. However, she quickly got over the bad effect, and kept well until January, 1889. She came up town in the following April. She was certainly better than she was two years ago, but had a very severe backache when she did much. 19th, 100 ma. for 5 minutes. 22d, 80 ma. for 10 minutes. 24th, 60 ma. for 9 minutes. 26th, 70 ma. for 10 minutes. 29th, 90 ma. for 10 minutes.

May 1st, 100 ma. 3d, 80 ma. 6th, 90 ma. 15th, 70 ma. 17th, 60 ma. 20th, 60 ma. 22d, 60 ma. for 10 minutes each. Is feeling very much better. 27th, 60 ma. for 12 minutes. 29th, 60 ma. for 9 minutes. 31st, 60 ma. for 10 minutes.

June 6th, 60 ma. 7th, 60 ma. 10th, 60 ma. 12th, 75 ma. 14th, 100 ma. for 10 minutes each. Is very much better. The tumor is very decidedly smaller.

Case XIX.—Married, age 57; was brought by Dr. M'Gibbon in August, 1887.

Dr. M'Gibbon had watched the growth of the tumor in this case for many years, and thirteen years before Dr. Keith had seen the lady with him. At that time she was 44 years of age, and had ceased to menstruate ten years before. It is doubtful how long ago it is since the tumor was first noticed, but in 1874 it extended up to the level of the umbilicus. At that date there was little discomfort, and as the tumor was growing very slowly, the patient was advised to wait and see what time would do for her. Year by year the mass steadily increased in size, and as time went on there began to be decided discomfort from its presence, and lately the general health has begun to be seriously affected, and the lady feels that if nothing be done she cannot live long. She is now never free from pain in the right side of the tumor, there is a constant feeling of weight and discomfort, and she has no rest

with her bladder, the desire to pass water being present night and day.

For thirteen years the tumor has grown from the level of the umbilicus until its upper part is hidden by the ribs. The pelvis was entirely filled by the mass, and the cervix was represented by a simple depression, into which a sound passed to a depth of $1\frac{3}{4}$ inches. The bladder was situated between the tumor and the anterior vaginal wall. As one part of the tumor was slightly softer than the rest, an aspirator needle was inserted, but no fluid was obtained for microscopical examination. The diagnosis of fibroid growth was thus confirmed, and it was determined to treat the tumor by electricity. In a case such as this, where there was no hemorrhage, and where the object was to lessen the size of the growth, the negative pole was connected to the internal electrode, passed into the uterine cavity, as, on account of the relation of the bladder, puncture could not be made. This was done in all of the twenty-three applications, the strength of current being not exact.

August 26th, 1887, 60 ma. 29th, 40 ma. 31st, 40 ma. for 5 minutes each. There was considerable pain after the first application five days ago, but already the patient feels better in every way, and there is a very decided diminution in the size of the tumor.

September 2d and 5th, 40 ma. for 5 minutes. The old lady thinks that she has taken a new lease of life, and said to-day that she felt as if she could not have gone on much longer without relief. 7th, 40 ma. 9th, 40 ma. 13th, 50 ma. for 5 minutes each. Until to-day it has been noticed that the tumor became smaller after every application. To-day, however, it is considerably swelled. 15th, 60 ma. for 5 minutes. The swelling of two days ago is gone. 17th, 60 ma. for 5 minutes. She says that she would be quite content with the present improvement; she does not have much pain, and can have a comfortable night's rest, as the irritability of the bladder is almost quite gone. 20th, 80 ma. 22d, 80 ma. 24th, 40 ma. 27th, 60 ma. for 5 minutes each. Is in the best of spirits to-day, and says that she feels very well indeed. 29th, 90 ma. for 5 minutes.

October 4th, 80 ma. 6th, 70 ma. 8th, 80 ma. for 5 minutes each. Feels very well, and the tumor is rapidly decreasing

in size. 11th, 80 ma. 13th, 120 ma. 15th, 90 ma. 18th, 50 ma. 20th, 80 ma. for 5 minutes each.

In every way the old lady feels better, she does not have any difficulty with her bladder, she has not any pain, and she can walk with ease. The tumor is not half as large as it was in August, two months ago, and is freely movable. In the beginning of April, 1888, Dr. M'Gibbon informed us that he heard that the tumor was rapidly decreasing in size. Some time afterward we heard that the old lady had died while away from home. Dr. M'Gibbon did not know what was the cause of death, but had heard that there had been a swelling of the tumor some time before, though this had subsided before her last illness.

Case XX.—Married, age 46; came to the Woman's Dispensary, Edinburgh, on the 29th August, 1887.

Patient, who is a widow, has been a martyr to asthma all her life. Twelve years ago she first observed a swelling in the abdomen about the size of an egg. It has been slowly but steadily increasing in size, and although it is by no means very large, it appears to cause more trouble to the organs inside the chest than one would expect in any but an asthmatic or bronchitic subject. She complained also of dysmenorrhœa.

Examination of the abdomen revealed a hard irregular tumor, extending to rather more than one inch above the umbilicus. It was markedly prominent, and was larger than the description would lead one to expect. The tumor was found to fill the pelvis, reaching to nearly the vaginal outlet. The cervix was shortened, and situated immediately behind the pubes. The cavity measured 5½ inches.

Treatment.—A puncture was made into the centre of the pelvic mass on the 29th of the month, and a current of about 40 ma. was allowed to flow for two and a half minutes. The application was borne very badly, and could not be continued for the usual length of time. After this first puncture, it was not thought necessary or advisable to repeat this method; so the sound was passed into the cavity and directed backward as much as possible. After the second application on the 5th September, the patient was confined to the house by an attack of bronchitis, and did not return for treatment until the 21st October. The current was passed on that day, and again on

the 24th, 28th, 31st, and then on the 4th, 14th, 18th, and 21st November. The strength varied from about 40 to 80 ma. She now felt much better in her general health, and was freer from attacks of asthma than she had been for a long time.

November 24th, 70 ma. 28th, 45 ma. for 5 minutes each.

December 2d, 75 ma. 9th, 60 ma. 11th, 85 ma. 14th, 100 ma. 17th, 115 ma. 20th, 125 ma. 23d, 135 ma. 30th, 170 ma. for 5 minutes each.

February 3d, 100 ma. for 5 minutes.

March 2d, 100 ma. 5th, 90 ma. for 5 minutes each. The tumor has been steadily decreasing in size, and is now not more than half as big as it was five months ago. 7th, 100 ma. 9th, 70 ma. 19th, 100 ma. 21st, 110 ma. 23d, 140 ma. 26th, 130 ma. 28th, 120 ma. 30th, 130 ma. for 5 minutes each. To-day the patient said, "It has made a new creature of me."

April 2d, 120 ma. 4th, 135 ma. 6th, 135 ma. for 5 minutes each.

In all, thirty-four sittings, at each of which the electrical current was passed from the clay pad on the abdomen to the negative electrode in the uterus.

The tumor is very much smaller probably about one-third of its original size.

In September the tumor was said to be still decreasing in size; there was less pain at the periods, and these lasted two instead of seven days; and, strangely enough, there had been no asthma.

Case XXI.—Unmarried, aged 46. This patient has had a large fibrous tumor for many years—at least twelve—and has often been urgent for its removal by operation. Her request was not acceded to, for her general health was always good, and she has been able to maintain herself by keeping a small lodging-house. Menstruation has entirely ceased for three years. The tumor is hard, and the circumference of the abdomen is 40 inches. She has some difficulty in moving about from its weight, and complains of pain in the back.

She had no faith in the proposed treatment, but submitted to it in the hope that the backache might be relieved.

Three applications of about 40 ma. were made on the 1st, 6th, and 16th September, 1887.

At first the patient thought that she was better, and then came to the conclusion that the back pain was worse. She

did not return for treatment. Hearing that she was not well, she was visited at her home, and was found washing down the common stair. Her circumstances prevented her taking rest.

Some months afterward we heard that she had had a severe flooding, and had to be plugged before the bleeding was checked. This was after an interval of nearly four years' absence of menstruation. There has been no return, and she is now able to look after her house, though the tumor is said to have increased.

Case XXII.—Married, age 60; was admitted into the Royal Infirmary, Edinburgh, in August, 1887.

The patient, a broken-down looking woman, thinks that she first noticed the tumor twelve or fifteen years ago. Menstruation ceased at the age of 51, but recommenced at 59 with fair regularity, and the loss is now great. Six months ago, she says that the tumor did not reach above the navel; now it entirely fills the abdomen, and passes well up underneath the ribs. It is slightly movable. The cavity is large and irregular, and a sound passes many inches into it. The os uteri admits the tip of the finger. On several occasions attempts were made to find out if there were any polypi, and in October a small one was removed. The size and irregular shape of the cavity may have prevented the removal of others.

Gaiffe's galvanometer was not obtained until the treatment was almost finished, so that the figures are not quite correct.

September 1st, 3d, 6th, and 8th, 40 ma. for 5 minutes. 10th, 35 ma. for 5 minutes. The tumor is swollen and painful. 13th, 40 ma. 17th, 40 ma. 20th, 60 ma. for 5 minutes each. The tumor has begun to diminish in size. 22d, 60 ma. 24th, 85 ma. 27th, 120 ma. for 5 minutes each. The patient says that she can walk better. 29th, 75 ma. for 5 minutes.

October 1st, 95 ma. 4th, 120 ma. 6th, 120 ma. for 5 minutes each. A small vascular polypus was removed with forceps from the cavity. 11th, 13th, 15th, 18th, 22d, 25th, 27th, and 29th, 120 ma. for 5 minutes.

November 1st, 120 ma. for 5 minutes. Bleeding, which has been almost continuous for the last two months, is now nearly stopped, and the patient says that she feels very well. Till now the sound has been positive, but as the bleeding was checked it was made negative. 3d, 5th, 8th, 10th, 15th, 17th,

19th, 22d, and 24th, 120 ma. for 5 minutes. 26th, 160 ma. for 5 minutes. Gaiffe's galvanometer was in use to-day. 29th, 150 ma. for 5 minutes. Since last application there has been a slight bloody discharge, due possibly to a sudden breaking of the current. The sound was made positive.

December 1st, 145 ma. for 5 minutes. The bleeding has stopped. 3d, 180 ma. 6th, 225 ma. 8th, 240 ma. for 5 minutes each. Goes home to-morrow feeling well, and with the tumor smaller in every direction.

Dr. Sinclair wrote on the 11th June, 1889: "The tumor enlarged very much after leaving Edinburgh, then diminished again a little, though still large in size, and at present is large and tender to touch. The bleeding has stopped for some time. Mrs. —— is at present very unwell, and I am not certain whether she will recover or not; there seems to be localized peritonitis and she also suffers from bronchial symptoms."

Case XXIII.—Single, age 50; sent by Dr. M'Kercher, Dalbeattie, in September, 1887.

This lady had been an invalid for a number of years, and as far as she can remember the tumor was first noticed about 20 years ago. The prominent symptom which the new growth has given rise to has been pain. There have not been occasional attacks of pain, but she says that she has not been without it for many years, and she does not remember when she last had a comfortable night's rest. This constant pain has slowly but steadily undermined her general health, and she has now for the last few years passed the whole of the winter in bed, being able to go about for only four months in the summer. There has, at no time, been any disturbance in the menstrual functions.

In September, 1887, the appearance of this lady was lamentable. She looked ill and miserable. She could not walk without support, and had to be assisted into the house.

On examination of the abdomen a large tumor was seen, which on account of the breadth of the pelvic bones was of much greater size than the description would lead one to suppose. The growth was very tender, and it was not possible to examine it except with the greatest gentleness. It was found to be of a very irregular shape, and to be composed of three main portions. The largest part was situated in the left side, and caused that side to bulge considerably, giving somewhat

the appearance of a tumor of the kidney. Between this mass and the umbilicus the tumor extended to two inches above the level of the navel, and on the right side it reached as high as that landmark. The uterine cavity measured four inches.

The treatment by electricity lasted for eight weeks, and during that time twenty-three negative applications were made, though unfortunately the exact strength of the current used is not known.

September 2d and 5th, 1887, 40 ma. for 5 minutes. The patient states to-day that she thinks that there is less pain. 7th and 9th, 40 ma. for 5 minutes. Is decidedly better, and the tumor can now be handled quite freely without causing pain. 12th and 16th, 50 ma. for 5 minutes. There has been a discharge of blood from the uterus for some days. 19th, 50 ma. 21st, 60 ma. for 5 minutes each. The improvement continues, and the tumor is rapidly decreasing in size. 23d, 80 ma. for 5 minutes. 26th, 60 ma. for 7½ minutes. The patient said to-day that she had been feeling so ill before she left home, that she thinks she would have been dead by now, had she not come to Edinburgh. 28th and 30th, 60 ma. for 5 minutes.

October 3d, 55 ma. 5th, 80 ma. 7th, 80 ma. for 5 minutes each. The mass of tumor on the left side does not now extend outward beyond a line drawn up from the anterior superior iliac spine, and the growth is at least a third smaller than it was at the beginning of last month. Yesterday the lady walked fully two miles and did not feel fatigued. 10th, 80 ma. 12th, 80 ma. 14th, 60 ma. 17th, 50 ma. 19th, 55 ma. for 5 minutes each. The tumor continues to decrease in size. 21st, 70 ma. for 5 minutes. 24th, 80 ma. for 5 minutes. 26th, 80 ma. for 7½ minutes. The patient is a new woman, and has the appearance of being in good health and spirits; she walks well, sleeps better, and has improved in every way. That part of the tumor which was situated in the loin is now between the umbilicus and ilium; and the part on the right side extends to barely a couple of inches above the pelvic brim, instead of being as high as the navel. The tumor is not as large as it was two months ago by fully one-half.

Extract from letter dated 29th June, 1889: "I think my general health has much improved. I was able to keep up all last winter. I think that the swellings have not increased.

I am still troubled with inaction and catarrh of the bowels, but I am stronger, and no fever now. I don't get so faint and sick as I did."

Case XXIV.—Single, age 28; was sent by the late Dr. Murray Gibson, of Portobello, to the Woman's Dispensary, Edinburgh, on the 5th of September, 1887.

Eight years before she had been delivered of an illegitimate child after a natural labor. From that time there had been more or less constant pain in the back and in the left side, aggravated at the periods, which were not unduly prolonged. A profuse flow of mucous discharge has pulled her down, and latterly she has had to give up her work.

The cavity of the uterus was found to be enlarged to 3½ inches, and on the left side and attached to the upper part of the womb was a hard, tender mass the size of a hen's egg.

The electrical current was passed from the abdomen to the sound in the cavity of the uterus on the 5th, 9th, 12th, 19th, and 30th September, and on the 10th October, the strength varying from about 40 to 80 ma. After the first sitting she felt a little better. After the third she went back to her work; and as she felt quite well by the end of September, and owing to some difficulty in getting leave for an hour or two to attend the dispensary, she gave up coming, and I have not heard of her since. There was simply a very slight thickening at one side of the uterus when last seen.

Case XXV.—Single, age 57; was sent to Edinburgh by Dr. Gemmel, of Dunoon, in September, 1887.

This case was one of those rare instances where a fibroid tumor of the uterus continued to grow and to give rise to increased disturbance for years after the menopause. The growth was first noticed at about the age of 49, and a year afterward menstruation ceased and has not returned. For four years before the cessation of the menstrual flow there had been a very considerable increase in the amount of discharge every month, so that it is evident that the tumor had been growing for at least eleven years. Of late there has been decided increase in the severity of the pain, and for the last five weeks the lady had been unable to lie down in bed on account of the discomfort and breathlessness. An extract from Dr. Gemmel's letter gives a very good idea of the precarious condition in which she was: "Six years ago she was seized

with sudden and severe pain in the left side, and for which she was treated by her Glasgow physician; and on the occasion of my being called, she complained of the same thing, accompanied, however, by some intestinal irritation. She is now back to her frail usual, and if nothing effective can be done, her health and strength will surely fail at no distant date."

The tumor was very large. It caused the right side to bulge greatly, and its upper limit could not be defined, as it extended high up beneath the ribs on both sides.

The treatment consisted of only nineteen applications, and had to be discontinued on account of the illness of the lady's mother. The patient, toward the latter end of the treatment, had to come an hour's journey by rail. Gaiffe's galvanometer was not used. The internal electrode was always made negative.

September 6th, 30 ma. 8th, 40 ma. 27th, 100 ma. for 5 minutes each. Owing to the death of a sister, the treatment had to be discontinued for three weeks. 29th, 105 ma. for 5 minutes.

October 1st, 100 ma. 4th, 120 ma. for 5 minutes each. Feels slightly more comfortable, and the tumor is a little looser. 6th, 105 ma. 8th, 120 ma. 11th, 110 ma. 13th, 120 ma. 21st, 80 ma. for 5 minutes each. The tumor is becoming smaller, and there is now a slight depression between it and the ribs. 24th and 28th, 100 ma. for 5 minutes. Is decidedly better, and can wear her stays for the first time in the last three years. 31st, 80 ma. for 5 minutes.

November 4th, 7th, and 11th, 80 ma. for 5 minutes. The tumor continues to decrease in size, and the patient can now lie in bed all night with comfort. 14th and 17th, 80 ma. for 5 minutes. The patient is very sorry that circumstances render it necessary that she should go home, as she is more comfortable, can eat and sleep well, and is able to walk somewhat better than she did.

Dr. Gemmel writes on 11th June, 1889: "I am very glad to report that Miss —— has benefited greatly by the electrical treatment she received last year for the large uterine fibroid. The swelling very sensibly diminished, the pain almost disappeared, and the severe attacks from which she suffered frequently departed, and life now seems to her worth living for. I have seen Miss —— to-day, and she expresses herself as now

wonderfully well, and thankful indeed that she placed herself under your care."

Case XXVI.---Single, age 36; was admitted into the Royal Infirmary in September, 1887.

For the last six years menstruation has been very profuse, and the patient has not been able to do any work for two years. Latterly she has been seldom clear of bleeding for more than a week or ten days at a time, and during the interval there has been a great leucorrhœal discharge. It is not uncommon for the bleeding to continue for three or four weeks. Two years ago the tumor was first noticed, and some time afterward the patient was admitted into Charing Cross Hospital under the care of Dr. Watt Black. Here she remained for several months, and for a time was decidedly better than she had been. For the last year she has been seldom out of bed for more than a few hours at a time.

On admission into the infirmary, the woman was found to be very weak, and able to do little. She had difficulty in geting up-stairs, and a very short walk was all that she could manage. The tumor extended up under the ribs on the right side, and to fully 2 inches above the umbilicus on the left. A sound passed easily to a depth of 6 inches, and then, after some manipulation, nearly 2 inches farther. Gaiffe's galvanometer was not used until the twenty-fifth sitting.

September 6th, 40 ma. for 5 minutes. The passage of the sound started a pretty brisk hemorrhage. 8th, 40 ma. for 5 minutes. There was not so much bleeding to-day when the sound was passed. 13th, 40 ma. 15th, 40 ma. 20th, 80 ma. for 5 minutes each. The period has been going on more or less for the last ten days. There was less discharge than usual. 22d, 80 ma. 24th, 90 ma. 27th, 80 ma. 29th, 70 ma. for 5 minutes each.

October 1st, 95 ma. 4th, 90 ma. for 5 minutes each. The patient is stronger, and can walk better; she managed half a mile to-day. 6th and 15th, 100 ma. for 5 minutes. There has been again an abatement in the quantity of discharge, and, besides, there was an interval of eighteen days. 18th, 100 ma. 20th, 120 ma. 25th, 120 ma. for 5 minutes each.

November 5th, 80 ma. for 5 minutes. There has been some hemorrhage for the last three weeks, but the total loss has not been great. 8th and 10th, 120 ma. for 5 minutes. 15th,

17th, and 19th, 100 ma. for 5 minutes. 22d, 100 ma. for 8 minutes. Was able to walk fully a mile. 24th, 100 ma. for 8 minutes.

December 3d, 150 ma. for 5 minutes. Gaiffe's galvanometer was used to-day. The period is over; it was bad for two days, and then slight for four. Less discharge than for at least a year, and there was an interval of four weeks. The general health and appearance are much improved. 6th, 275 ma. for 8 minutes. 8th, 285 ma. for 7 minutes. 10th, 190 ma. for 7 minutes. 13th, 300 ma. for 10 minutes. 15th, 210 ma. for 10 minutes. 17th, 285 ma. for 5 minutes. 20th, 210 ma. for 10 minutes. 28th, 200 ma. for 10 minutes. A moderately easy period has been passed, and the patient feels well and strong. 30th, 200 ma. for 10 minutes.

January 5th, 1888.—175 ma. for 10 minutes. 7th, 175 ma. for 10 minutes. 12th, 290 ma. for 8 minutes. 19th, 260 ma. for 8 minutes. The period has lasted five days, and the loss was not very great. 21st, 235 ma. 24th, 250 ma. 26th, 210 ma. 28th, 223 ma. 31st, 215 ma. for 10 minutes each.

February 2d, 175 ma. 4th, 180 ma. 7th, 240 ma. 9th, 215 ma. 11th, 210 ma. 21st, 195 ma. for 10 minutes each. There was less flow than for fully two years, and there was not any diminution in color noticeable. 23d, 200 ma. 28th, 175 ma. for 10 minutes each.

The sound was made positive in forty-six out of the whole number of applications.

The tumor is very much smaller, and no one would recognize the patient of five months ago.

It was suspected at one time that there was a polypus inside the cavity, and the cervix was dilated; but, on account of the very irregular shape of the uterine cavity, nothing could be felt, and forceps could not be passed up to the fundus.

August 30th.—Heard that the woman was very well, that the periods recur at intervals of five weeks, and that the quantity of blood is not great, and that it continues to diminish in amount.

Extract from letter, dated 13th March, 1889: "I was so well then (during a sister's illness); but this last two months I have been so ill with pain and a relaxed state of the bowels like slimy diarrhœa; also a discharge of a greenish color; some call it whites. The monthly periods are not so bad—two days

pretty bad, and two days not. I can manage with only keeping in bed one day now, and it never lasts longer than five days. The tumor keeps below the right ribs, as it was when I left Edinburgh; but I am sorry it grows higher in front toward the breast bone. I think myself that the treatment is still going on, and that the periods will get better as time goes on. The periods are also now regular once a month, which they were not before the treatment. Came any time before."

Case XXVII.—Single, age 35; was brought by Dr. Wm. Bruce in September, 1887.

For nearly two years this patient's general health had been becoming rapidly deteriorated by excessive losses of blood at the monthly periods. Instead of lasting three days, as was natural to her, the flow continued for ten or twelve days. About the beginning of the year it was noticed that there was a growth in the abdomen, which was diagnosed by Dr. Bruce to be a fibroid tumor of the uterus, and confirmed later on by Dr. Keith. Removal of the ovaries was recommended. In June the menstrual flow ceased; but, instead of improvement, there was even a more rapid loss of health and strength, as this was accompanied by great irritability of the stomach. In July and August the lady was taken to the seaside, and improved slightly in strength; for, instead of being unable to walk at all, she could manage 100 yards or so with difficulty.

In September she looked very ill and miserable; she was thin, the face was of a greenish shade, and the lips and eyelids were not even tinged with color. The dyspeptic symptoms gave great trouble; medicines and care with diet having no result.

On examination it was found that the tumor reached upward fully as high as the umbilicus. It filled the whole of the pelvis extending to within an inch of the outside; there was almost no vagina, and the cervix was drawn up in front out of reach of the finger, but could be felt through the thin abdominal wall. Two large arteries were felt running across from one side of the pelvis to the other.

As it was not possible to reach the cervix, the point of a needle had to be thrust into the tumor on every one of the eighteen applications which were made. The needle was connected to the negative pole of the battery. It is unfortu-

nate that the galvanometer, which was used, was not very correct, and the figures must be taken as being only somewhat nearly correct.

September 11th, 40 ma. 13th, 40 ma. 15th, 60 ma. for 5 minutes each. The tumor is to-day certainly smaller. 17th, 50 ma. for 5 minutes. There is a decided diminution in size even since the day before yesterday. 20th, 80 ma. 22d, 45 ma. for 5 minutes each. To-day the patient feels better; can walk more easily, and has not been so sick. The tumor continues to diminish. 24th, 40 ma. for 5 minutes. It was observed to-day that pulsation had ceased in the two arteries, which have been described as running across the upper part of the vagina. No puncture was ever made within $\frac{3}{4}$ of an inch of these vessels. 27th and 29th, 70 ma. for 5 minutes. The patient begins to have a much better color.

October 1st, 105 ma. 4th, 90 ma. 6th, 80 ma. 8th, 80 ma. for 5 minutes each. Yesterday the patient sailed round the Channel Fleet, which was lying at Queensferry. For at least a year, it would never have occurred either to her or to her friends that she could attempt such an excursion, far less that she could enjoy it. 11th, 100 ma. 13th, 120 ma. 15th, 90 ma. 18th, 90 ma. 20th, 100 ma. for 5 minutes each. The patient now feels stronger, and walked a couple of miles yesterday. There is a decided difference in the size of the tumor, and there is now room to pass the finger between the part of the growth in the pelvis and the symphysis pubis, and so reach the cervix. The tumor has lost about one-quarter of its bulk.

In the end of January the lady called to report progress. She had had two natural periods, and was steadily gaining ground in every way; and with the advent of the menstrual flow, all dyspeptic symptoms, which had given rise to so much disturbance, vanished as if by magic. She said that the tumor continued to decrease, and it did not show through her clothes, as it had formerly done. She could "do anything."

In September she was in perfect health.

January 19th, 1889.—It is now fifteen months since the treatment was concluded, and for a year she said that she had been absolutely perfectly well. She certainly looked the picture of health; the lips were of a good color; the body was evidently well nourished; there was no dyspepsia; and the periods were said to last three days, and to recur every four

weeks. She thinks that the tumor very slowly continues to decrease.

April 17th.—In a letter from Dr. Bruce, he speaks of the patient in the following terms:—"I saw Miss —— the other evening, and she is keeping remarkably well—a proof, which cannot be controverted, of the success of the new treatment."

Case XXVIII.—Single, age 41; came to Edinburgh in September, 1887. She was sent by Dr. Nivison, of Castle-Douglas.

The tumor was first noticed sixteen months ago, and of late has been growing rapidly. There is not any menorrhagia nor pain, but the lady complains of constant discomfort and a feeling of lassitude.

The tumor extends up to the level of the umbilicus on the left side, and scarcely so high on the right. The cervix is far back, and the introduction of the sound is difficult.

September 13th, 15th, 17th, 20th, and 22d, 40 ma. for 5 minutes. The tumor is one inch below the umbilicus, and the patient is to go home and return later on.

November 19th, 40 ma. for 5 minutes. The tumor is 2 inches below the umbilicus. 22d, 40 ma. 24th, 40 ma. 26th, 60 ma. 29th, 75 ma. for 5 minutes each.

December 1st, 125 ma. 3d, 95 ma. 6th, 100 ma. 15th, 100 ma. 17th, 100 ma. 20th, 115 ma. 22d, 100 ma. for 5 minutes each. The tumor is the same size as it was last month, but the old feeling of tiredness is gone. The sound was made negative on every occasion.

June 10th, 1889.—"I am sorry to say that the tumor is increasing; indeed, I think it is much larger now than when I was under treatment in Edinburgh. The flow is also increasing; last time it continued for a fortnight; but I seldom have much pain, and my general health is pretty good."

We know now that in this case the treatment was not continued nearly long enough. This patient will return for a proper treatment later on.

Case XXIX.—Married, age 31; came from Kansas, U.S.A., with the intention of having the ovaries removed or hysterectomy performed.

For the last eight years the patient says that she has not known what it was to feel well. There has been constant pain in the sides and back, and the periods last from ten to four-

teen days, and the amount of blood lost is said to be great and to be steadily increasing. For eight years she has been constantly under treatment, and in March, 1887, a fibroid tumor was removed after dilatation of the cervix. In April, the cavity of the womb was curetted, and this operation was followed by flooding. No treatment has given even temporary relief.

The patient is a tall, thin woman, with absolutely colorless face. The uterus is about twice its natural size, and the cavity measures 3½ inches.

The lady was very anxious to have an operation, as she had no faith in any less radical mode of treatment after her eight years' experience, and it was with difficulty that she was persuaded against it.

As the patient had come four thousand miles, and as she was never able to bear a strong current, forty-three applications were made, in half of which the exact strength of the current used is somewhat doubtful. The sound was always made positive.

September 14th, 16th, and 17th, 1887, 40 ma. for 5 minutes. The patient was exhausted after the first application, but now feels better. 19th, 60 ma. 20th, 40 ma. 21st, 40 ma. for 5 minutes each. Does not feel at all better, and is in very low spirits. 23d, 40 ma. for 5 minutes.

October 4th, 120 ma. for 5 minutes. The menstrual flow is over. It continued for nine days, and although the time was shorter the quantity of discharge was greater than it has been since April. 8th, 60 ma. 11th, 80 ma. 13th, 80 ma. 15th, 100 ma. for 5 minutes each. Thinks that she is perhaps a little better. 18th, 80 ma. 20th, 100 ma. 31st, 100 ma. for 5 minutes each. A second menstrual period is passed; in no respect any better than the last.

November 2d, 100 ma. 4th, 120 ma. 7th, 100 ma. 9th, 120 ma. 11th, 120 ma. 14th, 120 ma. 16th, 100 ma. for 5 minutes each. There has been a decided improvement in the last few days; and the pain in the back has been more bearable. 28th, 100 ma. for 5 minutes. The period is again over; it lasted eight days, and for the first half of the time was slight; now she feels depressed, and has had increased pain. Gaiffe's galvanometer was used. 30th, 90 ma.

December 2d, 100 ma. 5th, 100 ma. 7th, 100 ma. 9th, 110 ma. 12th, 160 ma. 14th, 135 ma. 23d, 75 ma. for 5 minutes

each. There has been decidedly less flow. 26th, 75 ma. 28th, 60 ma. 30th, 50 ma. for 5 minutes each.

January 2d, 1888, 80 ma. 4th, 60 ma. 6th, 50 ma. 9th, 65 ma. 11th, 65 ma. for 5 minutes each.

February 22d, 100 ma. for 5 minutes. Has been in the country since the last sitting, and has gained 2 pounds in weight. As regards the period there is nothing to record. 24th, 27th, and 29th, 100 ma. for 5 minutes.

April 17th.—"You will be pleased to hear I have got over a period in eight days, and not much any day of the eight. It also was a week longer than usual of coming on. It is the very best I have had for several years."

June 18th.—"I have been at home five weeks, and I am very glad to be able to say I am still keeping better. I have passed the third period since I stopped the electricity; each one only lasted eight days, a great improvement on what has been these last eight years. I still think it lasts a little too long, but trust I may yet derive a little more benefit from the treatment. The two last times I did not have much chance to improve: first we had a very stormy passage out (fourteen days crossing), then it has been intensely warm ever since we arrived. Mr. —— and all my friends are well pleased with the progress I have made. All tell me I am looking much better now than I have done for a number of years."

Case XXX.—Married, age 32; was sent to Edinburgh, and came to the Woman's Dispensary on the 19th September, 1887.

Two years ago, an attack of pain drew attention to a tumor in the abdomen. This mass is slowly increasing in size, and the patient suffers from inconvenience from some pain, and from frequent calls to pass water. Although the patient appeared to be in very good health, and, as far as could be made out, did not suffer very greatly, yet something had to be attempted, as it was not possible, or at least not likely, that the tumor would not give trouble in the next twenty years.

On examination, a very hard tumor was felt, extending upward to 1 inch above the umbilicus; to the right, to within $1\frac{1}{2}$ inches of the right iliac spine; and on the left, to within 1 inch of the iliac spine on the same side. The pelvis was tightly packed by the tumor, and the cervix was drawn up behind the pubes. The sound passed 5 inches forward in front of the tumor growth.

September 19th, 40 ma. 21st, 80 ma. 23d, 40 ma. for 5 minutes each. The tumor is smaller, and the cervix is lower down. 26th, 40 ma. 28th, 40 ma. 30th, 60 ma. for 5 minutes each.

October 3d, 40 ma. for 5 minutes. The tumor is fully 2 inches below the umbilicus. 5th, 40 ma. 7th, 40 ma. 12th, 40 ma. 14th, 45 ma. 17th, 40 ma. 19th, 40 ma. for 5 minutes each. Says that she is feeling much better. 21st, 50 ma. 24th, 120 ma. 26th, 60 ma. 28th, 100 ma. 31st, 120 ma. for 5 minutes each.

November 4th, 120 ma. 7th, 100 ma. 9th, 100 ma. 11th, 100 ma. 14th, 100 ma. 16th, 80 ma. 18th, 90 ma. 21st, 95 ma. 23d, 95 ma. 25th, 120 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day. 28th, 115 ma. 30th, 150 ma. for 5 minutes each.

December 2d, 150 ma. for 5 minutes. The tumor was punctured, as the cavity lay so much in front of the mass of tumor, and the needle was made negative. The tumor is not within 3 inches of the umbilicus.

After going home the patient wrote to say that she had swelled considerably, but had "dissolved again in the course of a few days." She promised to write again, but did not do so, and a letter of inquiry was returned marked "not known."

Case XXXI.—Married, age 44; was sent for to come to the Woman's Dispensary, Edinburgh, in September, 1887.

This patient's history had, indeed, been a sad one. She said that she had been to every doctor in Edinburgh, and that no one had been able to do her any good. Although she had not been well for fourteen years, or, as her husband states, twenty-one years, she was not really very ill until she caught cold about seven years ago. At that time she was in the early months of pregnancy. She was in bed for some weeks, and aborted. Since then her business has apparently consisted in trying to get well—at least during those times that she was not in bed. She had been an in-patient under the care of Professor Simpson and the late Dr. Angus Macdonald; and some two years ago, she was in the special ward for the treatment of ovarian disease. All of the usual remedies had been tried over and over again, and her recuperative power appeared to be so slight that operation could not be advised, more espe-

cially, as it seemed to be probable that it would be difficult, or perhaps impossible, to remove the ovaries. After three months' experience in the use of Dr. Apostoli's method, and being confident that the general tonic effect of the treatment would more than counterbalance any disturbance the passage of a sound might cause, the woman was sent for, and came for treatment on the first day she was able to be out of bed, three weeks after she got the message.

Patient is a thin, dark, sallow woman. On examination of the abdomen, an irregular tumor was felt lying against the abdominal wall, and extending to 3 inches above the pubes. In the pelvis, the cervix was found to be situated far back, and a part of the growth pressed on the bladder. The sound passed to a depth of $4\frac{1}{4}$ inches. The patient states that she has been in constant pain for the last seven years, and for fifteen years there has been a steadily increasing quantity of blood lost at the periods. Before, and for the first few days of the menstrual flow, pain is very much aggravated, and prevents her from sleeping. Menstruation now lasts for fourteen days, and recurs after an interval of one week; formerly, its duration was seven days, with a twenty-one days' interval. This was a very satisfactory case for the treatment, as there appeared to be a very general consensus of opinion that any operation would be attended by great danger to life.

September 21st, 40 ma. 23d, 50 ma. for 5 minutes each. Says that she feels stronger already.

October 3d, 40 ma. for 5 minutes. The period came on ten days ago; the loss of blood has been greater than usual, and the patient feels very ill. 5th, 40 ma. for 5 minutes. The bleeding stopped after the last application. 12th, 40 ma. 14th, 70 ma. 17th, 70 ma. 24th, 80 ma. for 5 minutes each. A second period since the treatment was begun is over. It lasted seven days, was not very severe, and there was an interval of two weeks instead of the usual seven days. 28th, 120 ma. for 5 minutes. There has been some bleeding for two days. 31st, 120 ma. for 5 minutes.

November 4th, 120 ma. for 5 minutes. Feels better and stronger, and looks more cheerful. 18th, 100 ma. for 5 minutes. Has been flowing for five days. Feels much better, is stronger, and can walk better, and has little pain. 25th, 135 ma. for 5 minutes. To-day was the first time that the strength

of current recorded is certainly correct. Has been "ill" again for five days, but is feeling wonderfully well. 28th, 155 ma. for 5 minutes.

December 5th, 135 ma. for 5 minutes. There has been rather more pain. 9th, 135 ma. for 5 minutes. The pain is relieved; there has been some hemorrhage for three days. 12th, 100 ma. for 5 minutes.

January 6th, 1888, 160 ma. for 5 minutes. Feels well, although there has been as great a loss of blood as she has ever had. The general health is undoubtedly much improved. 8th, 160 ma. 23d, 145 ma. 30th, 110 ma. for 5 minutes each. Flow six days. Does not feel strong.

February 3d, 130 ma. for 5 minutes. Is feeling better again. The weakness complained of at last visit was probably due to some little stomach derangement. 10th, 135 ma. 13th, 140 ma. 27th, 275 ma. for 5 minutes each. The period on this occasion lasted nine days; there was much less flow and much less pain. 29th, 220 ma. for 5 minutes.

March 2d, 250 ma. 5th, 230 ma. for 5 minutes each. The patient says that she feels quite well to-day, and has not done so for ten years. 9th, 245 ma. 19th, 270 ma. for 5 minutes each. There has been less loss during the menstrual period, which is just passed, than there has been for a long time. There was, however, more of the old pain for the first two days. 21st, 220 ma. 23d, 225 ma. 26th, 200 ma. 28th, 210 ma. 30th, 235 ma. 31st, 210 ma. for 5 minutes each.

April 2d, 210 ma. for 5 minutes.

The internal electrode was, in every one of the thirty-seven applications, attached to the positive pole of the battery.

Progress has been uninterrupted; and to-day the patient broke down completely. She has experienced what it was to be well, and was in terror lest the result of the treatment should not be permanent, and that there would be no one, as far as she knew, who would be able to give her relief. The following extract from a letter, dated 5th February, 1889, will show that her alarm was groundless, at least in the mean time: "My period now comes once a month, and lasts a week. I have pain a day or two before, and rather worse the first day of the period, but nothing to what it was before the electricity. My general health had been bad since the pain began. I have not felt so well for twelve years. After the treatment

was stopped I gradually got stronger, and have never been laid up a day since you left Edinburgh. I am able to walk without pain or discomfort of any kind, and can't feel grateful enough to you for all your kindness."

Case XXXII.—Married, age 29; came to the Woman's Dispensary, Edinburgh, in July, 1887.

The patient gave the following history:—She had been married five years, had never been pregnant, and had enjoyed good health until three years ago. At that time she was in bed for some weeks with "inflammation." For this she was treated in the country with hot-water injections and glycerin pads. Two years afterward she moved into town, and then consulted one of the younger medical men in Edinburgh. Treatment by glycerin pads was continued for nine months, the patient attending twice a week. At the end of that time she was told that she was incurable without an operation, and as one result of the operation proposed would be that she would have no children, it is to be concluded that removal of the ovaries was alluded to. She then came to the dispensary, complaining of constant severe pain in the left side, and of general debility. Menstruation regular, and as it had always been as regards quantity. Pain much worse at that time.

On examination, the cervix uteri was felt to be pointing forward, and the fundus to be in the hollow of the sacrum. The retroversion was evidently caused by the weight of a fibroid tumor, the size of a billiard ball, which was attached to the posterior part of the fundus. The uterine cavity measured $3\frac{1}{4}$ inches, and there was little mobility due to surrounding swelling. As efforts to replace the organ were of no avail, treatment by electricity was begun on the 21st September, the negative electrode being placed inside the uterus, and a current of about 40 ma. allowed to flow for 5 minutes. There was less pain after the first application; she felt able to do her housework after the second on the 23d; the period was commencing on the 28th inst. when she had the fourth. The fifth was on the 10th October, after an extremely easy menstrual flow. The ninth sitting was on the 4th November, immediately after a second period, which had been somewhat painful. The tenth application was made on the 11th, the direction of the current being reversed in this and the subsequent applications. November 28th, 125 ma. for 5 minutes

The period is just over; scarcely any pain, and feels very well.

December 5th, 100 ma. 12th, 85 ma. for 5 minutes each.

January 6th, 1888, 130 ma. for 5 minutes. The uterus can now be turned forward with the sound. 20th, 130 ma. for 5 minutes. Constant desire to pass water for the last four days, and the period was not got over so easily. 23d, 115 ma. for 5 minutes. The bladder irritability is better to-day. 27th, 95 ma. 30th, 100 ma. for 5 minutes each.

February 20th, 135 ma. for 5 minutes.

March 19th, 130 ma. for 5 minutes. The easiest period she has had for more than three years; rather more flow, and more natural (*sic*). 21st, 170 ma. 23d, 180 ma. 26th, 160 ma. 28th, 170 ma. 30th, 175 ma. for 5 minutes each.

April 4th and 6th, 150 ma. for 5 minutes.

The period has been exactly as it used to be years ago. There were twenty-seven sittings—nine negative and eighteen positive—with the local result as follows: Loss of tenderness, loss of fixation, marked reduction in the size of the tumor and also of the uterus generally.

In September the patient was very well; there was simply a little pain at the time of the flow every month.

January 19th, 1889.—In perfect health; no pain, and says that she feels "awful well," and there is no doubt but that she looked it.

Case XXXIII.—Single, age 40; was sent by Dr. Joseph Bell in September, 1887.

As this lady had to earn her own living, and as her occupation required that she should stand most of the day, it was necessary that she should be strong and enjoy good health.

The tumor was first noticed sixteen months ago. At that time she was feeling weak and unfit for work, and was losing too much blood every month. The periods, which formerly lasted but three days, now continue for from seven to ten; and instead of coming every three weeks, appear at irregular intervals. A long rest in the country has greatly improved the general health. At present she feels full and uncomfortable, and cannot go up-stairs without a rest. She fears that, as there has not been any improvement in the menstrual function, she will soon be unable to work.

The tumor was found to extend up to the umbilicus; the

cervix was far back, and the sound could be passed with considerable difficulty to a depth of 3 inches.

Twenty-four negative applications were made, the great majority in the evening, as the patient was employed during the daytime.

At no time was the patient able to stand a strong current, though it was only toward the end of the treatment that it could be correctly measured.

September 24th, 1887, 40 ma. 27th, 80 ma. 29th, 120 ma. for 5 minutes each. There is already a decided difference in the size of the tumor.

October 1st, 100 ma. 4th, 85 ma. for 5 minutes each. Every day the tumor is noticed to be smaller, and is now fully 1 inch below the umbilicus. 6th, 80 ma. for 5 minutes. Patient says that she feels smaller, and that her jacket is looser. She can now go up-stairs without a rest, and without panting for breath. 8th, 75 ma. for 5 minutes. Feels fuller to-day, and the tumor is within half an inch of the umbilicus. 10th, 80 ma. for 5 minutes. The tumor is smaller again to-day. 18th, 60 ma. for 5 minutes. Has had a remarkably easy period; very little pain, and less discharge. 20th, 60 ma. 22d, 50 ma. for 5 minutes each. There has been a good deal of pain for a day or two. 25th, 55 ma. for 5 minutes. The pain has gone. 29th, 60 ma. for 5 minutes.

November 3d, 40 ma. 6th, 35 ma. 15th, 40 ma. for 5 minutes each. There has been more loss than usual, but unaccompanied by pain, and now feels well and not so "puffy." 19th, 40 ma. 22d, 40 ma. 29th, 50 ma. for 5 minutes each.

December 13th, 55 ma. for 5 minutes. The period is over, and again there has been more discharge than usual. Gaiffe's galvanometer was used for the first time during the last application. 15th, 65 ma.

January 10th and 14th, 1888, 50 ma. for 5 minutes. 21st, 65 ma. for 8 minutes.

September.—Has not been an hour off work since January. The flow now lasts four days.

January 19th, 1889.—The periods last four or five days, and recur at regular intervals of three weeks. She says that she has nothing to complain of, and is "perfectly well, cannot tell how well." She told me that a short time ago she had met Dr. Bell, who said to her, "If you are half as well as you look, you would be a credit to any one." Sleeps splendidly now.

Case XXXIV.—Married, age 44; was sent to the Woman's Dispensary, for the electrical treatment, by Dr. M'Gibbon on the 28th September, 1887, as she was afraid that she would not be able to survive the frequent and great losses of blood if something were not done.

The patient had been quite well until about three years ago, when she began to notice that her periods were becoming unduly prolonged; that the quantity of blood lost was greater, and the interval between the flow was shorter. All those symptoms rapidly became worse, and, in addition, there was a profuse discharge of whites, so bad that she was never dry. She became anæmic, breathless, unable to walk, unable almost to do anything, in spite of ergot and careful attention to diet.

When first seen she looked very ill; lips and tongue without color, face greenish-yellow, breathless, and exhausted; legs much swollen with œdema, and she had not been able to walk to the dispensary.

Examination of the abdomen revealed the fundus of the uterus 2 inches above the pubes. In the pelvis the cervix was felt to be low down, deeply lacerated, with everted lips, and attached to the inner surface of the anterior lip was the tip of the tumor, which appeared to be incorporated with the anterior wall of the uterus. The cavity measured 3½ inches.

The periods now last twelve days, and recur regularly every month.

The treatment was begun on the 28th September, and repeated on the 30th—the strength of the current being about 40 and 50 ma., passed for 4 minutes. She felt better; there was less white discharge, and she was able to walk to the dispensary, as it was down-hill all the way from her house.

October 3d, 40 ma. 5th, 60 ma. for 4 minutes each. 7th, 40 ma. 10th, 50 ma. 12th, 40 ma. 14th, 80 ma. 17th, 85 ma. 19th, 50 ma. 26th, 50 ma. for 5 minutes each. She is immensely improved, can walk home, and does not look such a ghastly object as she did a month ago. The first period since the treatment was begun is just over. Instead of twelve, it lasted four days; and on three of those four, the discharge was comparatively slight. The leucorrhœa is stopped. The legs do not swell so much. 28th, 85 ma. 31st, 120 ma. for 5 minutes each.

November 2d and 4th, 120 ma. for 5 minutes. 7th, 9th, 11th,

14th, 16th, and 18th, 100 ma. for 5 minutes. 25th, 175 ma. for 5 minutes. To-day was the first day on which the measurement was correct; the previous numbers are approximate only, though they are probably not very far wrong.

The period is again over; it came on after a month's interval, and lasted five days. The amount of blood lost was rather more than on the last occasion. The growth, which had been seen as an excrescence on the inner surface of the anterior lip of the cervix, does not now project. 28th, 155 ma. 30th, 175 ma. for 5 minutes each.

December 2d, 155 ma. 5th, 145 ma. 12th, 110 ma. for 5 minutes each.

January 4th, 1888, 200 ma. for 5 minutes. The period has again lasted five days, and in spite of there being more loss, the patient does not feel so pulled down and debilitated by it. There has been no return of the white discharge. The legs are still somewhat swelled at night. In the morning there is scarcely any œdema.

The last application was made on the 6th January, and for some reason or other a current of only 80 ma. could be borne. Twenty-nine positive applications in all.

On the 4th April she came to say that she was steadily improving in health, though there was more blood lost every month than had been her habit before the illness. There was, however, not any leucorrhœa.

In September she was very well indeed, and was able to attend to her shop all day. She was not breathless, looked well, and the periods lasted eight days, with little quantity.

In January, 1889, I was unable to find her, but was told by another old patient, who had seen her two or three weeks before, that she was quite well in every respect.

Having heard in May, 1889, that this patient had undergone an operation, she was communicated with, and wrote to say that a tumor had been removed from the vagina, and that there had been persistent hemorrhage after the operation, necessitating "plugging" seven times. She goes on to say that she was beginning to lose as much blood as she did before the electrical treatment, and ends her letter thus: "I always say, if it had not been for the battery, I would never have lived."

This result is what experience has shown Dr. Apostoli's

treatment does for submucous tumor: it reduces the size, and makes them more or less pediculated. When treated by electricity, the tumor was part and parcel of the anterior wall of the uterus.

The tendency which the electrical treatment appears to have in causing, or at least in hastening, the expulsion of fibroid tumor situated near to the uterine cavity has been especially remarked on by Dr. La Torre, of Rome.

Case XXXV.—Married, age 49; was sent by Dr. Maxwell Ross, and was treated at the Woman's Dispensary, Edinburgh.

Her history was that she had had constant pain in the back for five years, and that this had been accompanied by very profuse loss every month, the periods lasting usually fourteen days.

On examination, the top of the uterus was felt 2 inches above the pubes. In the pelvis, the cervix was found to be large, lacerated, and situated low down. The sound passed to a depth of $3\frac{3}{4}$ inches.

This was evidently a case where the internal electrode would have to be attached to the positive pole of the battery, and this was done in every one of the twenty-eight applications which were made.

September 28th, 40 ma. for 3 minutes. 30th, 40 ma. for 5 minutes.

October 5th, 40 ma. for 4 minutes. 7th, 40 ma. 17th, 70 ma. for 5 minutes each. The period has been going on for a week, and an attempt was made to stop it with the current. This it did most effectually. 21st, 55 ma. 24th, 80 ma. 28th, 80 ma. 31st, 60 ma. for 5 minutes each.

November 4th, 60 ma. 11th, 60 ma. 14th, 80 ma. 21st, 80 ma. for 5 minutes each.

December 2d, 110 ma. for 5 minutes. The strength of the current was measured to-day for the first time with accuracy. The period, after lasting twelve days, is over, and the total quantity is not more than was often lost in a single day. 5th, 115 ma. 9th, 100 ma. 12th, 120 ma. 19th, 100 ma. for 5 minutes each.

January 4th, 1888, 120 ma. 8th, 180 ma. 29th, 115 ma. for 5 minutes each. Has just got over a very bad period, which has lasted for two weeks. There had been nothing seen for the previous six weeks.

March 2d, 220 ma. 7th, 180 ma. 9th, 160 ma. for 5 minutes each. The patient has been steadily improving since the end of last month, and says that she feels better than she has done since the month of November. 14th, 175 ma. 21st, 180 ma. for 5 minutes each. There has been a very easy period. 26th, 150 ma. 30th, 135 ma. for 5 minutes each.

What has been the exact result in this case will be shown by an extract from a letter written by Dr. Ross, who was good enough to see the patient and report, on the 5th February, 1889: "I called on Mrs. —— yesterday. She informed me that for a short time after the Apostoli treatment stopped she felt better generally. Her system was quieter, and she was less nervous. The hemorrhage is now much less than it was, but still comes at irregular intervals. In September last, she says she was seized with a shivering and a profuse discharge of blood, and slime came from the bowel. She also suffered from severe backache, and when she uses the vaginal douche, which she does frequently as it gives her relief, a clear but thick discharge comes away per anum 'from the back,' she says. She added that she felt at times that she would like to have the battery treatment again, but is hopeful, as the hemorrhage is diminishing, that she may now be recovering from her womb trouble. I did not examine her, and, in fact, up till yesterday had not seen her since you left Edinburgh."

Case XXXVI.—Single, age 37; was sent into Edinburgh by Dr. Bannerman, of Hawick, and was treated at the Woman's Dispensary.

The patient did not know that there was anything the matter with her until August, 1886. A few days before the period she was unable to empty her bladder, and the water had to be drawn off with a catheter. This has had to be repeated every month. The woman is a worker in a mill, and for a year had had to give up work for about one week out of every four. With the exception of this trouble with the water, the tumor, which was only discovered when the catheter was first passed, has given rise to little disturbance.

On examination of the abdomen, a hard, somewhat nodulated tumor was felt extending up to the umbilicus. The pelvis was filled by the mass to within 2 inches of the vaginal outlet, and the os was not to be felt, the vagina stretching away in front.

Treatment.—As the os uteri was not within reach, the centre of the mass in the pelvis was punctured to the depth of half an inch, and the current passed through the tumor on fourteen occasions. The figures given below are not absolutely correct.

September 28th, 1887, 40 ma. for 5 minutes.

October 2d, 40 ma. for 5 minutes. Menstruation is over; there has not been retention, and the tumor does not reach to within 1 inch of the umbilicus. 5th, 40 ma. 7th, 40 ma. 12th, 30 ma. 14th, 50 ma. 17th, 35 ma. 19th, 40 ma. 24th, 70 ma. for 5 minutes each. The second period since the treatment was begun is over. Again the catheter was not required. 26th, 60 ma. 28th, 70 ma. 31st, 100 ma. for 5 minutes each.

November 2d, 100 ma. for 5 minutes. 4th, 100 ma. for $7\frac{1}{2}$ minutes. The patient now feels very well. The tumor is decidedly smaller in the pelvis; it reaches almost up to the level of the umbilicus on the right side, and is fully 3 inches below that level on the left. The os uteri is now easily within reach.

On March 10th, 1888, she wrote to another patient, telling her that she had not the slightest ailment; that she had not required to have the water drawn off; and that she had not required to ask leave of absence even for five minutes, and this although they had been working over-time.

July 11th, 1889.—Dr. Bannerman wrote that this patient had never experienced any inconvenience since the electrical treatment.

Case XXXVII.—Single, age 44; consulted Dr. Keith four years ago, and was told that she had a fibroid tumor of the uterus; but at that time her health was quite good.

The history of this case dates back to eight or ten years ago, as it was about that time that it was first noticed that the loss every month was increasing in quantity. It is only two years, however, since the loss became so great as to affect the general health, and during those years the tumor has increased with comparatively great rapidity. The mass was originally situated entirely in the right side, but of late has increased so as to fill the left side also. The flow now continues for seven or eight days, and the patient is in bed for two or three of them. In addition to the loss, she finds that many things which she could do formerly, she either cannot do now or can accomplish only with an effort.

The treatment consisted in thirty-five applications, in the first seven of which the internal electrode was made positive, and in the remainder negative. Gaiffe's galvanometer was used after the fifteenth application. During the first half of the treatment the lady lived in Edinburgh; in the second half she came through from Glasgow twice a week, and by a convenient arrangement of trains, she was able to be back at home within three hours.

On examination of the abdomen, the tumor was found to reach to fully 1 inch above the umbilicus on both sides, and to be smooth and regular in outline. The cervix was situated immediately behind the pubes, and a sound entered, after curving first to the left and then very much back, to a depth of 6½ inches.

September 29th, 1887, 40 ma. for 5 minutes.

October 1st, 70 ma. 4th, 50 ma. for 5 minutes each. 6th, 8th, and 11th, 100 ma. for 5 minutes. The period has begun to-day, a week too soon. The tumor does not reach up to the umbilicus on either side. 22d, 100 ma. for 5 minutes. This period has been the worst she has ever had. 25th, 90 ma. for 5 minutes. The outline of the tumor is becoming broken up, and there are now several distinct lobules. 29th, 120 ma. for 5 minutes.

November 1st, 2d, and 5th, 120 ma. for 5 minutes. Begins to feel a decided improvement in the general health. 9th, 11th, and 12th, 120 ma. for 5 minutes. 26th, 75 ma. for 5 minutes. The second period is over. It was again worse than usual, though not so severe as the previous one. Gaiffe's galvanometer was used to-day. 29th, 65 ma. for 5 minutes.

December 1st, 110 ma. 3d, 75 ma. for 5 minutes each. The tumor now is much lobulated, and is smaller on the left side. 6th, 80 ma. 8th, 150 ma. 10th, 130 ma. for 10 minutes each. 21st, 150 ma. for 5 minutes. This month the period lasted but four days, and there was less loss than the patient ever remembers to have had.

January 4th, 1888, 150 ma. for 5 minutes. 7th, 150 ma. 19th, 175 ma. for 10 minutes. There has been more discharge, but much less than usual. 21st, 150 ma. 25th, 170 ma. 28th, 155 ma. for 10 minutes each.

February 1st, 190 ma. 14th, 180 ma. for 10 minutes each. A very slight period, lasting three days, is over, and the lady

feels well and strong. 18th, 175 ma. 22d, 190 ma. 25th, 185 ma. 29th, 190 ma. for 10 minutes each. There is now not much tumor to the left of the middle line, and on the right it reaches to within 1 inch of the umbilicus.

August 9th.—An opportunity was given of examining the tumor, which was found to be more lobulated, but of much the same size as it was in February. The general health is fairly good, the periods are normal, there is a natural quantity of blood lost, and there is not any necessity to go to bed.

May 3d, 1889.—The tumor is rather smaller than it was in August. The periods last for four days, and for two of these the lady keeps quiet in bed. The growth of the tumor has been arrested, the monthly losses have been lessened, and the general health has been improved.

Case XXXVIII.—Single, age 37; from Glasgow.

For a number of years this lady has been more or less of an invalid, and has had to go abroad every winter. She ascribes her ill health to the circumstance that she suffers every month from prolonged and profuse menstrual discharge, the flow continuing for eight days, and to a feeling of wretchedness and depression at these times. Treatment of all kinds has been tried; but in spite of it all, each year sees her a little weaker, and with a greater loss at the periods.

On examination the cervix uteri is found to be situated far back in the pelvis, and the fundus to be lying against the abdominal wall above the pubes. A sound can be passed, with considerable difficulty, to a depth of four and a half inches. The pelvis is full of tumor, which can be felt some inches above the pubes all across the pelvis.

Thirty-six applications with the positive pole in the uterine cavity were made.

September 20th, 1887, 40 ma. for 5 minutes

October 3d, 40 ma. for 5 minutes. The patient was very tired after the first application. 5th, 7th, and 24th, 40 ma. for 5 minutes. The period is over, the quantity of blood lost was much the same as usual, but the discomfort and feeling of depression was absent, and to-day the patient feels stronger than usual. 26th, 40 ma. 28th, 60 ma. 31st, 40 ma. for 5 minutes each. The lady says that she feels in every way much better, is stronger, and can walk farther and with more comfort.

November 2d, 80 ma. 4th, 120 ma. 18th, 40 ma. for 5 minutes each. There has been a greater loss of blood than usual. 21st, 50 ma. 23d, 60 ma. 25th, 60 ma. 28th, 155 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day. The patient continues steadily to improve. 30th, 140 ma.

December 2d, 115 ma. 5th, 135 ma. 7th, 90 ma. 9th, 100 ma. 21st, 125 ma. for 5 minutes each. The loss this month was less than it has been for some time. 23d, 125 ma. 26th, 115 ma. 28th, 125 ma. 30th, 175 ma. for 5 minutes each. The patient now walks very much better, and is quite satisfied with the progress that she is making.

January 2d, 1888.—125 ma. 4th, 150 ma. 6th, 135 ma. 10th, 150 ma. 12th, 175 ma. 14th, 175 ma. 16th, 160 ma. 23d, 115 ma. for 5 minutes each. This month there has been less discharge than for many years; and to-day, instead of feeling ill and sore, the patient says that she feels about as well as she ever did in her life. 25th, 130 ma. 27th, 140 ma. 30th, 150 ma. for 5 minutes each.

October.—Has been quite well.

June 25th, 1889.—Periods natural and feels well. The tumor is now freely movable, scarcely to be felt in the pelvis, and the cervix is in front instead of being almost beyond reach.

Case XXXIX.—Single, age 47; was seen with Dr. Finlay, of Trinity.

This patient has been ailing for some years; she cannot walk as far as she used to be able to do, and when she stands there is a good deal of pain, especially in the left side. There is also menorrhagia, which is steadily becoming worse. The tumor was noticed fifteen months ago, and is now very decidedly larger than it was at that time. She is a woman who will not take care of herself, and does what she likes as the fancy takes her.

The tumor is round and prominent, and extends from half way up to the umbilicus to low down in the pelvis. The cervix is small and situated far back.

October 7th, 1887.—100 ma. 11th, 100 ma. 13th, 175 ma. for 5 minutes each. Feels more comfortable. 15th, 150 ma. 29th, 125 ma. for 5 minutes each. The period has been much as usual, but accompanied by more pain.

November 1st and 3d, 100 ma. for 5 minutes.

January 12th, 1888, 140 ma. for 5 minutes. The patient had been so well until the last few days that she did not think it necessary to come for treatment. 14th, 125 ma. 17th, 100 ma. 19th, 170 ma. for 5 minutes each.

February 7th, 130 ma. for 5 minutes. The period has been decidedly worse than usual; now she feels better. 9th, 160 ma. 11th, 170 ma. 14th, 175 ma. for 5 minutes each.

March 1st, 180 ma. 3d, 180 ma. 6th, 175 ma. 8th, 190 ma. 10th, 190 ma. 28th, 180 ma. 30th, 180 ma. for 5 minutes each. The sound was always made positive.

Having heard that we were leaving Edinburgh the patient became very anxious to have more treatment.

Dr. Finlay wrote on the 11th June, 1889: "Miss —— had distinctly less bleeding for three months after the electrolysis, and also felt more comfortable and had less feeling of fulness from the tumor. Since then she says she has been much as before, and will not allow that she has derived permanent benefit from the treatment. In her case I can feel the tumor in the left iliac region from the outside on deep pressure and also from the vagina. I see Miss —— occasionally on account of eczema from which she suffers, and her general health appears to me to be wonderfully good."

Case XL.—Married, age 31; came to the Woman's Dispensary on the 7th of October, 1887.

Patient has been married for three years, and enjoyed fairly good health until six months ago, although for many years there has been some pain in the back, which has always been worse during menstruation. For two years there has been considerable feeling of weight and discomfort. Half a year ago the tumor was noticed, attention being called to it by a pain described as if a hand were inside the abdomen tearing at something.

Menstruation has been normal, except on one occasion, when, after having been examined by a number of students in the infirmary, there was said to have been a flooding. She says she is very uncomfortable before the menstrual periods from swelling of the tumor. A very hard, prominent tumor extends up to the level of the umbilicus. There is no mobility of the mass, which is somewhat tender. In the pelvis, the tumor is felt also to be quite immovable, and a small cervix is reached with great difficulty, very high up on the right

side. Any attempt to remove the ovaries would probably have been unsuccessful. The patient, a tall, well-made woman, looked very miserable and ill.

At the first nine sittings the strength of the electrical current recorded is probably not exact.

October 7th, 40 ma. 10th, 40 ma. 14th, 35 ma. 17th, 45 ma. for 5 minutes each. On account of the difficulty in reaching the os, and consequently in passing the sound, it was thought best to puncture the centre of the mass in the pelvis to the depth of one-third of an inch. After the first application even, there was an improvement; the patient looked and said she felt better, and there was a decided diminution in the size of the tumor. The first four applications reduced the level of the tumor to 2 inches below the navel, made it more movable, and allowed of the fairly easy passage of a sound. 31st, 40 ma. for 5 minutes.

November 4th, 50 ma. 11th, 50 ma. 14th, 70 ma. 18th, 50 ma. 28th, 65 ma. for 5 minutes each.

There have been two periods, before which the discomfort due to swelling of the tumor has been absent; the patient feels very well, and there is a vast difference in her appearance.

December 2d, 75 ma. 5th, 70 ma. 9th, 125 ma. 12th, 135 ma. 16th, 115 ma. for 5 minutes each. The tumor is much smaller, is more movable, and can be handled without producing discomfort.

January 6th, 1888, 140 ma. 8th, 160 ma. 10th, 145 ma. 13th, 135 ma. 27th, 50 ma. for 5 minutes each. At the beginning of the year there was pain in the tumor for some days. This was relieved by a single application. The tumor had not become swelled, and there was not any apparent cause for the return of pain—neither tenderness nor fixing. The period was passed through quite easily, except for a "queer" feeling low down. 30th, 120 ma. for 5 minutes.

February 3d, 145 ma. 6th, 160 ma. 24th, 140 ma. 27th, 140 ma. 29th, 135 ma. for 5 minutes each.

March 2d, 145 ma. for 5 minutes. The relation of cervix to the tumor has improved, so that, since the 30th January, it has not been necessary to resort to puncture. The period in February was passed through easily; there was not any swelling, and but little pain. 5th, 260 ma. 7th, 190 ma. 9th, 200 ma. 23d, 185 ma. 26th, 220 ma. 28th, 230 ma. 30th, 235 ma. for 5 minutes each.

April 2d, 160 ma. 4th, 150 ma. 6th, 200 ma. for 5 minutes each.

The treatment consisted in thirty-seven applications; in twenty puncture was employed; and the puncture of one day was never detectable even when the next one was made two days afterward. The result was a diminution of the tumor by at least one-half, and a complete change for the better in the general health of the patient.

In September the tumor was smaller than it had been in April, but there was considerable pain in the groins after the periods, and when this was bad she was very miserable.

June, 1889.—Have heard that she has been a patient in the infirmary, and that she has been sent home without anything having been done. This is not altogether surprising, as she was a difficult woman to manage.

Case XLI.—Married, age about 37; was seen with Dr. Burn Murdoch in October, 1887.

Nine years before this time patient had been seen on account of a fibroid tumor of the uterus shortly after an attack of rheumatic fever, which had left the heart in a very weak condition. At that time, there were occasional hemorrhages from the kidneys. Now the general health is very poor, and there is great abdominal discomfort, with pain in the back. Until the last period there has not been excess in the menstrual flow.

The lady looks ill and miserable, and on examining the abdomen, a very large hard tumor, extending up beneath the ribs on both sides, is seen. The tumor is not movable, and is very prominent and gives rise to great difficulty in walking. The uterine cavity measures 8 inches. The treatment consisted in thirty applications—twenty-three in which the internal electrode was positive, and seven in which it was negative. Gaiffe's galvanometer was not used until the ninth sitting.

October 10th, 1887, 40 ma. 12th, 30 ma. 14th, 40 ma. 17th, 50 ma. for 5 minutes each.

November 18th, 70 ma. for 5 minutes. The treatment has been stopped for the last month on account of an attack of rheumatism. 21st, 65 ma. 23d, 70 ma. for 5 minutes each. The patient says that she is beginning to feel stronger, and can sleep better; she can also get about with more comfort. 25th, 70 ma. 28th, 75 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day. 30th, 75 ma. for 5 minutes.

December 9th, 110 ma. for 5 minutes. A perfectly natural period is over, and the lady is in great spirits, as she feels so much better. 12th, 165 ma. 14th, 215 ma. for 5 minutes each. 16th, 170 ma. for 8 minutes. 19th, 180 ma. for 10 minutes. 21st, 210 ma. for 8 minutes. The patient can now take what she calls a good long walk. The left side of the tumor is becoming much smaller. This was the side which has grown of late. 23d, 200 ma. for 8 minutes. 26th, 210 ma. for 5 minutes.

January 4th, 1888.—210 ma. for 5 minutes. The period has been again quite natural. 6th, 150 ma. 9th, 140 ma. for 5 minutes each. The sound has been made negative during the last two applications. The lady's husband measured her round the waist ten days ago, and again to-day, and finds that there is a diminution of 3½ inches. 16th, 210 ma. 18th, 250 ma. for 5 minutes each. The sound was again made positive, as the patient had had a great deal of domestic worry, and was afraid that she might have a bad bleeding. 30th, 175 ma. for 5 minutes. The period has been very slight, and lasted but three days. The tumor continues to decrease rapidly. The sound was negative.

February 1st, 210 ma. 3d, 200 ma. for 5 minutes each. The waist measurement shows one inch less in the past four weeks. 27th, 90 ma. for 5 minutes. Another easy period, in spite of measles, with accompanying bother, having appeared in the household. 29th, 130 ma. for 5 minutes. Feels splendidly well. Measures 32 inches round the waist instead of 37 on the last day of the year. On the right side the tumor is quite free of the ribs, and on the left there is a great hollow. The cervix is almost out of reach, and the tumor appears to be smaller by at least a half.

March 27th, 210 ma. for 8 minutes. 31st, 110 ma. for 10 minutes. These two positive applications were made on account of a painful spot on the right side, and gave complete relief.

September.—Tumor continues to decrease in size; the periods are regular, and there is not any pain, except very occasionally. Is better in every way than for the last eight years.

January 19th, 1889.—The tumor is still said to be diminishing in size. At times there is a spot on the left side which causes pain, but in every other respect the general health is perfect, and she has been able to do as much as most women.

Case XLII.—Married, age 24; came to the Woman's Dispensary, Edinburgh, on the 10th of October, 1887.

Until she was married in August, 1886, she had been a perfectly healthy girl. The uterine functions were normal and regular; the periods lasted three or four days, and recurred every four weeks. Very shortly after her marriage, she began to feel not so well as she had done, and to experience pain during coitus. Soon there were pains, at first at times, and latterly constant, in the back, right side, and down the right leg. The pain was so severe as to prevent her sleeping, and was always much worse at the commencement of a period. Six months after the marriage the menstrual flow lasted for three weeks, and was very abundant, and from that time she has rapidly gone down hill, and has got thin and anæmic. The periods now usually last for two weeks, and recur in seven, twelve, or fourteen days. For six months she has been in bed nearly all the time, and is quite unable to do her housework. The patient had never been pregnant.

On making a pelvic examination, the first thing noted was extreme tenderness, which rendered the examination somewhat difficult. The cervix was situated far back, and on placing the hand on the abdomen, a tumor of the uterus was felt, extending to within half an inch of the level of the anterior superior iliac spine. This tumor was situated principally in the right side and in front, and was immovably fixed, apparently by cellular swelling outside the growth; hence the dyspareunia.

Treatment.—The sound connected to the positive pole of the battery was passed into the cavity of the uterus, and currents of electricity of doubtful strength, but probably never exceeding fifty milliampères, were passed through the tumor for five minutes on each occasion, on the 10th, 14th, 17th, and 21st October, and 4th, 11th, 14th, and 18th November. After the second application she felt better; after the third there was increased pain in the back. Before the fifth there had been a period, very much the same as usual. Six applications improved her decidedly; she had little pain in the back, and was able to be out of bed all day, and to do her housework. The second period after the commencement of the treatment came on after an interval of nineteen days, and lasted only four days.

November 28th, 45 ma. for 5 minutes.

December 2d, 50 ma. 5th, 75 ma. 9th, 65 ma. 12th, 60 ma. 16th, 65 ma. for 5 minutes each. The menstrual flow again lasted but four days, but was accompanied by more pain.

January 4th, 1888, 80 ma. 8th, 60 ma. 13th, 60 ma. 20th, 65 ma. 23d, 65 ma. 27th, 110 ma. 30th, 135 ma. for 5 minutes each. The flow this month lasted four days, and was still painful.

February 3d, 65 ma. 6th, 75 ma. 20th, 65 ma. 24th, 100 ma. 27th, 100 ma. 29th, 100 ma. for 5 minutes each. The period at the middle of the month was not accompanied by any pain. The tumor is smaller and less tender. Toward the end of the month there was some return of the backache.

March 2d, 75 ma. 5th, 190 ma. 14th, 85 ma. 19th, 110 ma. 21st, 105 ma. 28th, 130 ma. 30th, 120 ma. for 5 minutes each. There was not any pain with the menstrual flow this month, and the patient looks and feels very well, and much stronger.

April 2d, 125 ma. 4th, 90 ma. 6th, 95 ma. for 5 minutes each.

The tumor is fully 1 inch lower in the abdomen than it was six months ago; there is not much pain; there is not any menorrhagia, and the general health has much improved.

The treatment has consisted of thirty-seven applications, the positive pole being placed inside the uterine cavity.

On January 21st, 1889, I found this patient in perfect health, "feeling nothing at all the matter." Since the beginning of June she has been quite well; the periods last three or four days, and recur every four weeks with unfailing regularity. There is not any pain in the back, side, or leg, and dyspareunia is a thing of the past.

No tumor could be felt in the abdomen; in the pelvis the cervix was found to have moved forward to a natural situation; the body of the uterus felt a little big, there being barely a trace of the old tumor. There was complete mobility and no tenderness.

Case XLIII.—Married, age 34, the mother of five children; was seen in consultation with Dr. Woolston in October, 1887.

The patient was a delicate little woman, whose general health had become much deteriorated by a greatly increased quantity of blood lost at the menstrual periods, and the flow now continues for eight, instead of three days. In addition,

she suffers from frequent headaches, and has very considerable difficulty in walking, and is altogether in very poor condition.

On examination it was found that the uterus was large, swollen, and retroverted. The cavity measured 3½ inches, and the uterus could not be replaced with the sound unless undue force had been used. Situated in the left broad ligament, and connected to the left side of the uterus, was a mass about the size of a billiard ball. For some months a ring pessary had been worn, with great relief to the back.

The treatment consisted in twenty applications of electricity—the internal electrode being on every occasion connected to the positive pole of the battery. Gaiffe's galvanometer was used to measure the strength of the current in the last eight applications only.

October 11th, 40 ma. 13th, 40 ma. 15th, 40 ma. 18th, 60 ma. 25th, 80 ma. for 5 minutes each. The period is over, and there has been some improvement; it lasted five days, and there was less discharge. The lady feels stronger, and says that she can walk better, even although she is not wearing the pessary. 27th, 80 ma. for 5 minutes.

November 1st, 120 ma. 2d, 100 ma. for 5 minutes each. The patient feels stronger; the uterus is lighter, and can be replaced with the sound with care and without pain. The mass on the left side is smaller. 5th, 100 ma. 15th, 60 ma. for 5 minutes each. The period came on a week before its time, and although it has been going on for six days, and is not yet stopped, yet the patient does not feel weak and pulled down as she used to do. 17th, 70 ma. 19th, 70 ma. 29th, 160 ma. for 5 minutes each. Feels stronger, and says that her head feels much clearer.

December 1st, 155 ma. 3d, 100 ma. for 5 minutes each. Is feeling very well indeed. On the way home after the last application there was a good deal of pain felt in the lower part of the abdomen. 8th, 75 ma. 10th, 110 ma. 20th, 115 ma. for 5 minutes each. There is not any tumor to be felt on the left side. There has been much less loss this time.

January 3d, 1888, 75 ma. 7th, 110 ma. for 5 minutes each. Feels very well. The uterus is smaller, and can be easily turned forward, and there is not a trace of the outgrowth which was formerly attached to the left side.

April 6th.—Is very well indeed.

September.—The periods now last two or three days; there is not any pain, nor any headache, and, in spite of the fact that her five children and herself have had whooping cough, she is now in excellent health.

Extract from letter received on 12th March, 1889: "I have had no return of any of the symptoms I had before I was under your care, and feel very grateful to you for making me so much better. The illness I have had lately was entirely owing to the whooping cough, which I had last autumn, accompanied by bronchitis, and which reduced my strength so much that in January I had another threatening of bronchitis, and was very weak. I am getting better now but may not venture out of doors yet."

Case XLIV.—Single, age 37; came to the Royal Infirmary, Edinburgh, from Greenock, in January, 1887, and was admitted as an in-patient into the special ward for the treatment of ovarian disease.

The patient was a fair-haired woman who had to work for her living. The history was that, until the age of 29, she was quite well and regular in every way. About that age she began to lose more blood every month than had been habitual to her. At first, this did not cause alarm, but after a time, and when she found that she was not so strong as formerly, and that month by month she was slowly losing ground, she became anxious for treatment. As treatment, which she obtained in Greenock, did not do much good, she went to Glasgow and consulted Dr. Robert Bell two years ago. An enlargement of the womb was then discovered, and appropriate remedies ordered and persevered with for a long time with little, if any, good result. She is now confined to bed for at least one week every month.

Examination at this time revealed a uterine tumor extending to 3 inches above the pubes, and entirely filling the pelvis. It was useless to tell a patient, so ill as this one was, that she must wait until the menopause for twelve or fifteen years, so she was advised to submit to removal of the ovaries. As this was one of the cases where it was apparent that there would be probably difficulty in getting them out, the patient was told that, should it be found to be impossible to do so, no attempt would be made, at that time, to take away the tumor itself.

On the 20th January, 1887, the operation was performed by Dr. Keith in the presence of Dr. Hodsdon and the usual number of students. As had been expected, the right ovary was found, after a prolonged search, incorporated with the tumor; the Fallopian tube was injured during the manipulation, and was removed. What appeared to be the left ovary was reached very far back, and also so situated that its removal would have necessitated injury to the tumor. Neither benefit nor injury followed the operation, and the patient went home in the same condition as she had come, except for the presence of a scar on the abdomen.

The patient returned in October of the same year, being anxious to try if electricity would do for her what surgery had failed to do. The tumor had grown rapidly, and now, instead of reaching only to 3 inches above the pubes, extends to the same distance above the umbilicus. The cavity measures 4¼ inches.

Unfortunately, a galvanometer of doubtful accuracy was used to measure the strength of the current for the first fourteen applications. Forty-five applications were made altogether, the current being passed from the sound inside the cavity of the womb toward the clay pad on the abdomen.

October 15th, 30 ma. 17th, 40 ma. 19th, 80 ma. 21st, 100 ma. 24th, 70 ma. for 5 minutes each. The patient thinks that she feels a little stronger. 26th, 80 ma. for 5 minutes.

November 4th, 100 ma. for 5 minutes. The loss at the period has been more than usual; she was in bed for seven days; but there was none of the dysmenorrhœa which has been present for the last few years. 8th, 100 ma. 10th, 100 ma. 15th, 65 ma. 17th, 60 ma. 19th, 60 ma. 22d, 50 ma. 24th, 50 ma. 26th, 105 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day.

December 6th, 100 ma. for 5 minutes. The second period is over; the loss of blood was much the same as last time and there was again little pain. 8th, 10th, and 13th, 80 ma. for 5 minutes. Thinks that she is gaining a little strength. 15th, 130 ma. 17th, 100 ma. 18th, 150 ma. 20th, 150 ma. for 5 minutes each.

January 3d, 1888, 150 ma. for 5 minutes. The third period has been much the same as the two previous ones; but the patient feels stronger than she has been accustomed to do im-

mediately afterward. 5th, 150 ma. 7th, 150 ma. 10th, 175 ma. 12th, 175 ma. 14th, 175 ma. 17th, 150 ma. 19th, 170 ma. 21st, 165 ma. 28th, 160 ma. for 5 minutes each. In spite of a somewhat more profuse flow than usual the patient feels decidedly stronger. 31st, 150 ma.

February 2d, 200 ma. 4th, 150 ma. 7th, 220 ma. 9th, 210 ma. 11th, 230 ma. 16th, 220 ma. for 5 minutes each. The patient says that she feels better and stronger than she has done for six years. 18th, 210 ma. 25th, 180 ma. 28th, 220 ma. for 5 minutes each.

March 1st, 220 ma. for 5 minutes. At the last period, between the 18th and 25th ultimo, the patient required to be in bed two days instead of the usual seven, and the amount of blood lost was not more than half her usual. She is now able to walk better, feels stronger, and the tumor is about one-third smaller than it was. This patient was one of the few who took the trouble to write often and report how she was, after going home; and the following are extracts from her letters.

May 24th.—"I was rather worse this time my period was on; the time was the same, but the quantity was more than it was either of the last three times."

June 22d.—"I am sorry to say that my period this time was not any better, just the same as last time. I cannot say I feel any stronger than I felt when I left Edinburgh."

July 23d.—"I am glad to say that my period this time has been much better. I think there would be about half the quantity this time that there was either of the last few times, and it just continued six days. I think this time I would only have about five or six times more than it ought to be. I cannot say anything about the size of the tumor, but I think it must be much smaller, I feel so easy—not the swelled, crushed-up feeling I had; but if you would like to see, I would go in to Edinburgh a day either after my next period or after next again."

The patient was not aware at this time that we had left Edinburgh for London.

August 20th.—"I have been much the same this period as I was last, but I feel a difference in strength; the last three or four weeks I have been much stronger."

October 22d.—"I am sorry I cannot say that there has been any improvement since I wrote in August; last month

and this one my periods have been much the same as the two previous; the quantity was about the same, but the time was one day longer (seven days). It is a year the middle of this month since I went to Edinburgh to have the electricity; I am greatly improved since then; then I had to be in bed six days, and up and down three or four; now I have just to keep my bed for two days, and three or four up and down."

December 15th.—"I am much pleased to be able to send a good report this time. My period last month was much improved, and this month the quantity was even less than last month, and it just continued five days. I had not to be in bed this time at all, just on the sofa a good deal for four days. I think the quantity now will only be three or four times more than it ought to be. I have not been able to gather very much strength yet, I get weakened down so much every month; but now the bleeding is so very, very much less, I think I should begin to pick up. I will let you know in three months how I get on. I am afraid I am troubling you writing to you so often."

March 18th, 1889.—"I am glad to say I continue to improve. My periods are better than when I wrote last, and I am also feeling stronger, although I cannot go a whole day yet without lying down to rest for about two hours. What a difference there is on me since this time last year!

"I will write in six months and let you know how I am then. I think if I improve the next six months as I have been doing I should be pretty well."

Case XLV.—Married, age 45; was seen with Dr. Finlay in October, 1887.

For a number of years this patient had suffered from menorrhagia, though it has only been serious for the last two. Sometimes the loss is said to be so bad as to amount to a flooding. A year ago some polypi were removed from the cervix, and since then there has been some slight improvement. In addition to the loss there is constant discomfort in the lower part of the abdomen and in the pelvis, accompanied by irritability of the bladder.

On examination, the tumor is found to be as large as a newly-born child's head, and to press very much on the bladder. The cervix is situated very far back in the pelvis, and the passage of a sound is a work of extreme difficulty. The depth of the uterine cavity is $3\frac{3}{4}$ inches.

Nine applications were made, the sound being positive. The treatment had to be discontinued on account of the death of the lady's husband, and was not resumed on account of our removal from Edinburgh.

October 18th, 1887, 40 ma. 20th, 40 ma. 22d, 40 ma. 27th, 60 ma. 29th, 80 ma. for 5 minutes each.

November 10th, 80 ma. for 5 minutes. The quantity of discharge has been much the same as usual, but there has been less pain. 12th, 80 ma. 15th, 65 ma. 17th, 80 ma. for 5 minutes each.

Dr. Finlay wrote on June 11, 1889: "She says that she noticed no difference in the amount of the discharge; she has, however, never had to send for me since then on "account of profuse hemorrhage, as she used to have to do. She looks much better, and I am sure she is so."

Case XLVI.—Married, age 29; was admitted into the Royal Infirmary, Edinburgh, in October, 1887.

At the beginning of the present year this patient was delivered of a still-born child. There was no particular difficulty at the birth, and there was not supposed to be any reason why it should have been followed by a constant discharge of blood for three months. The bleeding became so severe whenever the erect posture was assumed, that the great part of those months was spent in bed. From that time until admission into the infirmary, there has been very great menorrhagia every month, the flow lasting from ten to twelve days.

The woman is now blanched, and is able to do very little for herself, and says that she has been as many days in bed as out of it, since her baby was born.

On examination of the abdomen a uterine tumor is felt to extend to two inches above the pubes.

Before the treatment was commenced the quantity of urea excreted by the kidneys in twenty-four hours was estimated, and was found to average about 240 grains. The day after the first application it dropped to 172 grains, and then gradually rose to 236 grains per diem.

October 15th, 40 ma. 18th, 60 ma. 20th, 55 ma. 25th, 120 ma. for 5 minutes each. The period came on a week too soon; it did not continue for longer than half the usual time, and there was not so much loss, on the whole. She says that she feels stronger. 29th, 60 ma. for 5 minutes.

November 1st, 60 ma. for 5 minutes. To-day the sound, which had previously been positive, was made negative. 3d, 5th, 8th, 10th, and 15th, 120 ma. for 5 minutes. Improvement in the general appearance has been very marked, and the patient says that she feels better than she has done for the last eighteen months. 17th and 24th, 120 ma. for 5 minutes. Menstruation has occurred at an interval of four weeks, and the loss has been less than there has been for five or six years. The patient says that she feels quite well. The tumor is smaller, but there is not a very marked difference in its size.

February 23d, 1888.—The late patient is now perfectly well; she has a good color and has got quite stout, and this in spite of the fact that she has had to nurse her husband for most of the time she has been at home, and has now brought him to the infirmary. She says that the tumor, which formerly felt to her like a big egg, is now not to be felt at all.

Case XLVII.—Married, age 40; came to Edinburgh in October, 1887. Rather more than two years ago, a tumor which at that time could be felt above the pubes was discovered. For several years before this was found, the patient had been treated for displacement, she says. There is great trouble with the bladder, as sometimes there is difficulty in passing water, at other times difficulty in retaining it, and occasionally it comes away involuntarily on coughing. Menstruation is regular, but painful, the pain commencing for some days before the flow, which continues for seven days, and is becoming very profuse. Large clots are passed as a rule. On examination, it is found that the tumor extends almost up to the umbilicus, and is said to swell enormously before the periods. The mass is felt to descend very low into the pelvis, there is no cervix, and the os can be felt with difficulty very high up in front.

At first it was found to be necessary to make punctures, though, later on, and when the growth had diminished in size, a sound could be passed into the uterine cavity. The current was always allowed to flow from the abdomen to the puncturing needle or sound.

October 24th, 35 ma. 26th, 30 ma. for 5 minutes each. Has slept better. 28th, 40 ma. for 7 minutes.

November 1st, 40 ma. 3d, 40 ma. 5th, 35 ma. 7th, 35 ma. 9th, 40 ma. for 5 minutes each. 11th, 50 ma. 14th, 60 ma. for

7 minutes each. Is sleeping very much better, and the appetite is much improved. 23d, 60 ma. for 5 minutes. The period is over, and has been much as usual, except that there was little swelling of the tumor. 25th, 60 ma. 28th, 90 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day.

December 12th, 100 ma. 14th, 110 ma. 16th, 110 ma. 26th, 115 ma. for 5 minutes each. There is no longer any trouble with the bladder, and the lady is able to get about better and can get up-stairs more easily. 28th, 150 ma. for 5 minutes.

January 7th, 1888, 110 ma. 9th, 100 ma. for 5 minutes each. A puncture was not made to-day, the sound being passed into the uterine cavity instead. Says she feels as if she could fly. 11th, 110 ma. 24th, 150 ma. for 5 minutes each. The applications are decidedly easier when a puncture is not made. The period has been much as usual. 26th, 150 ma. 21st, 170 ma. 31st, 180 ma. for 8 minutes each.

February 2d and 18th, 180 ma. for 8 minutes. There has been rather more discharge, but the patient feels very well. 21st, 180 ma. for 8 minutes. 23d, 190 ma. for 10 minutes. 25th, 180 ma. for 8 minutes. 28th, 180 ma. for 10 minutes.

March 1st, 175 ma. 3d, 195 ma. for 10 minutes each. 6th, 200 ma. for 8 minutes. 8th, 250 ma. 17th, 150 ma. for 10 minutes each. The period has been much as usual. 20th, 200 ma. 22d, 200 ma. 24th, 160 ma. 27th, 180 ma. 30th, 170 ma. for 10 minutes each.

April 1st, 110 ma. for 8 minutes. The lady is very well, and the tumor is about half the size it was before.

Dr. Nicholls wrote on 30th April, "Mrs. —— wishes me to write and let you know how much she has improved. The tumor is much less, and she can walk with comfort."

June 25th, 1889.—"She has certainly derived permanent benefit from the electric treatment, but has been ill with bronchitis lately. The left fibroid tumor is doing well; but some time back there was a fresh formation in the right side, which I thought might require your treatment. You will be pleased to hear this is now better."

Case XLVIII.—Married, age 37; was brought to Edinburgh by her husband, who is a doctor, in October, 1887.

For several years this patient has not been in very good health, and the monthly periods are lasting longer and the quantity of discharge is steadily increasing. Fifteen months

ago, the tumor was first noticed, and it has grown with considerable rapidity, and now its weight is beginning to be a very serious matter, as it prevents her getting about. In the summer-time the lady became pregnant, and it was thought advisable to get rid of the fœtus. Life is beginning to be a burden, and the care of her house and of her children is a great source of fatigue.

The tumor is found to be of some considerable size. It extends upward to fully 2 inches above the umbilicus, and passes well into both loins. The cavity is toward the right side, and a sound passes without difficulty to a depth of 9 inches.

Naturally, the husband was very anxious, as the tumor had evidently opened up both broad ligaments, and as the lady was not very strong. Although he knew, of course, that Apostoli's treatment was not of very old standing, yet anything seemed to be better than the risk of hysterectomy.

The treatment consisted in nineteen sittings, the internal electrode being made negative on every occasion. The reason why there were not more was because the patient became anxious to get home for Christmas; and after getting home, she preferred to wait and see what would be the result before commencing again.

October 25th, 40 ma. 27th, 80 ma. 29th, 100 ma. for 5 minutes each.

November 1st, 100 ma. for 5 minutes. Already there is an appreciable difference in the size of the tumor. 3d and 5th, 100 ma. for 5 minutes. 12th, 100 ma. for 7½ minutes. The period is over. There was less discharge than for some time, and the patient does not feel so exhausted as usual. 15th, 17th, and 19th, 100 ma. for 5 minutes. The tumor is slowly diminishing in size, and the patient feels stronger. 22d and 24th, 100 ma. for 5 minutes. 26th, 140 ma. for 5 minutes. Gaiffe's galvanometer was used to-day for the first time.

December 1st, 120 ma. 3d, 210 ma. for 5 minutes each. There is a marked lessening in the size of the tumor. 10th, 180 ma. for 5 minutes. A fairly easy period is over. 13th, 225 ma. for 5 minutes. 15th, 115 ma. for 8 minutes. 17th, 230 ma. for 10 minutes. There is a decided improvement in every respect.

Extracts from husband's letters:

January 24th, 1888.—"It is now a month since my wife re-

turned from Edinburgh, and time for me to report progress. So far as size of tumor goes, I think that it is less than when you saw her last—not much, but decidedly on the left side. One period has passed, fairly moderate, but followed, as before, by a pretty steady discharge of a chocolate color. She has complained much of the left iliac pain—not constantly, but very severe for hours at a time; if anything, less often within the last ten days. Her strength is very far from satisfactory; in fact, she has been able to be out very seldom."

October 27th, 1888.—"It is now six months since last I wrote to you about my wife's case, and I am anxious to let you know how things have gone. You may remember that then she was having periodic attacks of pelvic pain with raised temperature and a constant brownish discharge from the uterus, usually small in amount, with, at times, great uterine tenesmus and the discharge of large clots. This went on till the end of May, when there was to be felt on the right side a boarding condition of the abdominal wall up to the level of the umbilicus—in fact, the tumor on that side seemed to be glued into the pelvis and covered with the lymph resulting from these attacks of cellulitis. On the left side the tumor seemed less. Her general condition was very bad. She was very anæmic, and as thin as a whipping-post, and you would have given very little for her chance of recovery. Early in June I removed her carefully to Stonehaven, her native air, and she seemed to pick up from that time on. She had only one attack soon after going there, and since then her recovery has been steady and satisfactory. I simply trusted to rest and change as you suggested. May, June, and July, there was no period and no discharge of any kind; August, a mere show; September and October, a very moderate and painless, and, in fact, perfectly natural period. She stayed three and a half months in Stonehaven, and now, since she came home, she feels and looks perfectly well; excellent appetite, and no discomfort of any kind. She has evidently run the gauntlet of severe cellulitis to what is apparently a perfect cure—*i.e.*, she would not know she had or ever had a tumor. The physical examination of the abdomen reveals the tumor very much less in every direction—hardly to be felt on left, and the effused lymph absorbed entirely, so far as palpation can make out. She herself swears by electricity."

Case XLIX.—Married, age 45; was sent by Dr. Dunsmure. This patient, who was terribly anæmic, had known of the presence of a tumor for seven or eight years. For eight years there have been severe bleedings—so severe, indeed, that it has on several occasions seemed as if she would die from loss of blood. Her mother says that she has counted as many as one hundred and twenty napkins. The periods last for two weeks, and there is an interval of one week, sometimes two. She is, as might be expected, very weak, and is so breathless that she can scarcely walk. Some years ago a sloughing submucous tumor came away, and there was slight improvement for a short time afterward.

The tumor is very large and prominent. It extends up under the ribs. The sound enters for at least 9 inches; curiosity ceased at this distance. For the treatment of a tumor bleeding as this one was doing, it was evident that the positive pole would have to be attached to the sound.

October 25th, 1887, 35 ma. 27th, 80 ma. 29th, 100 ma. for 5 minutes each.

November 1st, 100 ma. 3b, 100 ma. for 5 minutes each. The tumor is slightly movable. 17th, 80 ma. for 5 minutes. There has been a good quantity of blood lost at the period, though it lasted but seven days. 19th, 22d, and 24th, 80 ma. for 5 minutes. 29th, 100 ma. for 5 minutes. Gaiffe's galvanometer was used to-day.

December 1st, 90 ma. 13th, 140 ma. for 5 minutes each. The period has been much the same as the last. The interval was, however, longer than usual. 15th, 140 ma. 17th, 150 ma. for 5 minutes each. 20th, 100 ma. 22d, 140 ma. for 8 minutes each. 24th, 170 ma. for 5 minutes. 27th, 210 ma. 29th, 230 ma. for 8 minutes each.

January 12th, 1888, 210 ma. for 5 minutes. There has been less discharge than for a long time; and although the flow continued for eleven days, the bleeding ceased nearly every day for several hours. 14th, 250 ma. 17th, 200 ma. 19th, 200 ma. 21st, 200 ma. 24th, 216 ma. 26th, 160 ma. for 5 minutes each.

There is slight improvement, and the tumor does not now extend upward under the ribs on the right side. There was a severe hemorrhage after this, and the treatment was, on account of other reasons, not resumed before we left Edinburgh.

In September there appeared to be some decided improvement; there was less discharge, and the lady was able to take her food better, and there was not any sickness.

January 19th, 1889.—The patient is a little better than she was a year ago, and the treatment has at least prevented her getting worse for the last twelve months. She intends, if possible, to come up to London, and by continuing the treatment in her own bed, the progress will be more rapid than when she had to drive more than four miles for each application.

May, 1889.—This lady's mother says that she finds a very decided improvement both in the general health and in the quantity of blood lost. A sister was much surprised to find that she was able to walk from the cab into the house, as when she had seen her last, two years before, the patient had to be carried everywhere. The tumor has diminished in a wonderful manner since the treatment was stopped more than a year ago, and it is now not more than half the size it was. It is up to the ribs on the left side, and a hand's-breadth below them on the right, and is freely movable. The abdominal wall is quite fat, and the skin can be pinched up, instead of being tightly stretched over the tumor.

May 13th, 130 ma. 15th, 140 ma. 17th, 130 ma. 20th, 140 ma. for 5 minutes each. The period is due to-day, though since the treatment last year it sometimes does not appear for seventeen, or even eighteen days. 22d, 135 ma. 27th, 130 ma. 29th, 140 ma. for 5 minutes each. The period came on yesterday, eight days late. 31st, 135 ma. for 5 minutes.

June 3d, 140 ma. 5th, 120 ma. for 5 minutes each. This has been the least bad period for a very long time, and the lady was confined for only six days. 7th, 135 ma. 10th, 150 ma. 12th, 150 ma. 14th, 170 ma. for 5 minutes each. The tumor is decreasing with great rapidity, and the patient walks about the house more easily. 17th, 160 ma. 19th, 165 ma. for 5 minutes each. The patient has been outside for a walk. Two years ago she had to be carried on account of breathlessness. 21st, 200 ma. 24th, 150 ma. 26th, 205 ma. 28th, 230 ma. for 5 minutes each. The period is commencing to-day. During the past week the lady has walked more than she has done for five years.

July 1st, 230 ma. 3d, 200 ma. 5th, 240 ma. 9th, 250 ma. for 5 minutes each. The loss has been comparatively slight.

Case L.—Single, age 36; was sent into the Royal Infirmary, Edinburgh, in October, 1887, by Mr. Imlach.

In January of the same year this patient was operated on at the Samaritan Free Hospital, for the purpose of curing the symptoms due to the presence of a fibroid tumor of the uterus. The operation was evidently removal of the ovaries, and the name of the hospital where it was performed is a sufficient guarantee that it was properly done. From the woman's history, there can be no doubt but that the operation was most certainly justifiable at that time, though now, she might have been cured more certainly and more quickly without having the abdomen opened. It is probable that there was some difficulty experienced in reaching the ovaries, as the cicatrix was of extraordinary length for such an operation.

The patient made a good recovery, and there was not any bleeding for two months. It was not very bad at that time. The flow came on again in April and in May, but in June there was what is described to have been a severe flooding. Medicine was prescribed at the Samaritan Hospital, and the bleeding ceased after this had been taken for ten days. The flooding again returned in the beginning of August, and lasted for the whole of the month. This debilitated her so much that she was unable to follow her employment, that of a lady's maid. In September and October there has been more or less bleeding almost every day, and the woman is now very breathless and anæmic.

The tumor extends to midway between the pubes and umbilicus, is very irregular, and there is a mass pressing down on the bladder. The patient is not very sure whether the growth is smaller or not since the operation, and, as she is not any better, is naturally disappointed. There is great difficulty in getting a sound into the uterine cavity, but it can be passed to a depth of rather more than 4 inches.

October 25th, 1887, 60 ma. 27th, 80 ma. 29th, 70 ma. for 5 minutes each.

November 1st, 80 ma. 3d, 120 ma. for 5 minutes each. The patient thinks that she feels a little better. 8th, 120 ma. 10th, 80 ma. 15th, 85 ma. for 5 minutes each. There has not been any bleeding since yesterday, and she really feels stronger, and can walk better. 17th, 85 ma. 19th, 90 ma. for 5 minutes each. The tumor is not pressing so much on the bladder to-

day, and there is consequently less discomfort. 22d, 95 ma. 24th, 85 ma. 26th, 100 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day. There is steady improvement generally, and less bleeding. 29th, 120 ma. for 5 minutes.

December 1st, 130 ma. 3d, 110 ma. 6th, 100 ma. 8th, 170 ma. 10th, 135 ma. 13th, 175 ma. 15th, 200 ma. 17th, 165 ma. 20th, 175 ma. for 5 minutes each. Improvement is steady, and the tumor is becoming smaller. Up till and including to-day the applications have been positive. 22d, 170 ma. 24th, 140 ma. 26th, 120 ma. for 5 minutes each. The sound in the cavity has been attached to the negative pole of the battery at the last three sittings, but the bleeding has recommenced. 28th, 145 ma. for 5 minutes. A return was made to-day to the positive applications, as the bleeding had increased. 30th, 180 ma. for 5 minutes.

January 5th, 1888, 150 ma. 7th, 180 ma. 12th, 150 ma. 14th, 175 ma. for 5 minutes each. There is a very marked difference in the size of the tumor. The patient feels well. 17th, 160 ma. 19th, 220 ma. 21st, 210 ma. 24th, 230 ma. 26th, 180 ma. 28th, 200 ma. 31st, 205 ma. for 5 minutes each.

February 2d, 200 ma. 4th, 180 ma. 7th, 185 ma. for 5 minutes each. There is now little tumor; the irregular and to a certain extent pediculated growths have almost entirely disappeared. 9th, 200 ma. 11th, 210 ma. 16th, 200 ma. 18th, 220 ma. 21st, 210 ma. for 5 minutes each. Says that she feels splendidly well. The cavity measures $3\frac{3}{4}$ inches. 23d, 190 ma. 25th, 200 ma. 28th, 200 ma. for 5 minutes each.

March 1st, 185 ma. 3d, 220 ma. 6th, 235 ma. for 5 minutes each. Says that she now feels quite well.

In May she was in a situation, and was perfectly well.

March 19th, 1889.—There are still attacks of bleeding at times, though never very severe. The patient has been in a situation and able to do her work since she left Edinburgh. She is not anæmic, and the tumor is found to be smaller than it was a year ago.

June 6th.—"I am much better than when I saw you last."

July 4th.—There has not been any discharge for three months, and the patient looks and says that she feels perfectly well.

Case LI.—Married, age 37; came to Edinburgh in October, 1887, for the electrical treatment.

The illness has been of long standing—there having been profuse menorrhagia for many years, and the presence of a tumor was noted some eight or ten years ago. She was seen at her home in Newcastle some years ago, and at that time was very ill. There was phlegmasia dolens of both legs, and there were emboli in the lungs. She was at this time in bed for eight months. After this illness there was some improvement in the general health. The tumor is growing steadily. The present condition of the patient is, that she suffers much from the size of the tumor and from the pressure it gives rise to, and the lady is almost entirely unable to walk.

The abdomen is enormously distended by a tumor which must weigh at least thirty pounds; the ribs and sternum are raised all round, and the mass is quite immovable. The sound passes to a depth of 9 inches, and does not then reach to the top of the cavity.

This was a case where it would have been very advisable to treat the patient in her own bed, but we did not then have suitable apparatus for that purpose. She could not walk nor drive, so had to be brought in a Bath chair.

October 29th, 1887, 40 ma. 31st, 35 ma. for 5 minutes each. There has been pain in the back since the first application.

November 2d and 4th, 40 ma. for 5 minutes. The patient feels stronger already. 7th, 50 ma. 9th, 80 ma. 11th, 85 ma. for 5 minutes each. The tumor is looser, and the patient did not feel tired after the last application. 14th and 16th, 80 ma. for 5 minutes. Is walking better, and can go up-stairs more easily. 18th, 80 ma. 26th, 30 ma. for 5 minutes each. There has been more flow than usual. Gaiffe's galvanometer was used for the first time. 28th, 80 ma. 30th, 100 ma. for 5 minutes each.

December 1st, 110 ma. for 5 minutes. Is stronger, and walked a quarter of a mile to-day. 3d and 5th, 110 ma. for 5 minutes. 7th, 125 ma. 9th, 150 ma. for 5 minutes each. 12th, 200 ma. for 8 minutes. 14th, 210 ma. for 5 minutes. 16th, 210 ma. for 10 minutes. The tumor is slowly decreasing in size. 26th, 220 ma. for 10 minutes. Again a bad period. The tumor is to-day smaller than it has been for many years. 28th, 175 ma. 30th, 230 ma. for 10 minutes each.

January 2d, 1888, 250 ma. for 10 minutes. The lady's dresses are all too loose. 4th, 180 ma. 6th, 180 ma. 9th, 250 ma. 20th,

185 ma. for 10 minutes each. Another bad period, accompanied by pain. Though the general condition and appearance have much improved, the lady has lost seven pounds in weight since the treatment was begun. She is much pleased with her appearance. 23d, 200 ma. 25th, 220 ma. for 10 minutes each. She had a dress taken in 2 inches. 26th, 200 ma. for 10 minutes. Is to go home for a time and see how she gets on. The tumor is now so freely movable, that it is an annoyance when she turns round in bed. The sound was always made negative.

February 2d.—"You will have heard from Dr. Hume how pleased he was to find me so much better: so most of the friends I have seen think. They see a great change in my figure."

In July she sent a friend with a large fibroid; but as menstruation had ceased, and she had begun to improve, treatment was not advised.

July 25th.—"I am a great deal better and stronger since I was with you last winter, and have never felt the same inconvenience in breathing that I used to have. The tumor went lower down when with you, and has kept there; but, as you know, it is a large one yet, and a great burden to me; also I have just as much discharge as ever."

The lady came back in October, 1888, to try and have the tumor further reduced in size, and also with the hope of being cured of the necessity of having to go to bed for three days every month. The tumor had become smaller since January, and the lady looked very well. She felt so well also that she proposed to stay with friends at Streatham, and come in three times a week for the treatment. Ordinary persons require to allow themselves seven minutes to walk to the station, but at first Mrs. —— had to give from fifteen to twenty minutes.

Half an inch of sound was exposed in the cavity of the uterus, and was made positive.

October 9th, 100 ma. 11th, 125 ma. 13th, 135 ma. 15th, 135 ma. 17th, 135 ma. 19th, 140 ma. 21st, 155 ma. 24th, 155 ma. for 5 minutes each. Certainly the tumor is smaller.

November 2d, 135 ma. for 5 minutes. Not a good period, but looks well. 3d, 130 ma. 7th, 135 ma. for 5 minutes each. Feels that she can walk more lightly. 10th, 145 ma. 12th, 165 ma. for 5 minutes each. The lady had a busy day to-day.

She left home about half-past ten, arrived at Charles Street about half-past eleven; had the application, rested, and then met a party, composed chiefly of children, and had lunch. After lunch they went to see an afternoon performance of the "Armada" at Drury Lane, and did not get home until nearly seven o'clock. 14th, 175 ma. for 5 minutes. 16th, 19th, 21st, and 28th, 150 ma. for 5 minutes. As much discharge as usual, but feels better and stronger.

December 1st, 140 ma. 3d, 150 ma. 5th, 135 ma. 7th, 150 ma. 10th, 150 ma. 12th, 150 ma. for 5 minutes each. Is very well, and can walk to the station in seven minutes like other people.

February 22d, 1889. — The lady's husband wrote: "I am happy to say she continues better, and is able to walk about and see her friends. She considers that she has profited very much by your treatment, and looks forward to still greater progress toward convalescence as the year advances."

June 27th.—"I am very much better in health, and every one tells me that I have lost that suffering look they say I had. I can walk much farther and quicker, and am altogether nothing like such a burden to myself. The tumor is a good deal less than even when I saw you last (but still it is large). It is lower down, so does not interfere with my breathing."

Case LII.—Married, age 51; no family.

The patient said, that for fully a year, she had had a constant and profuse discharge, which was usually more or less bloody. It had begun gradually; at first the regular periods being prolonged, and there was a thick yellowish discharge in the intervals. Gradually the "red" and the "white" became merged together, and the patient was unable to tell whether there were any menstrual flow or not. The general health had naturally been seriously affected, and the lady was thin, nervous, and miserable.

Twelve months before, a diagnosis of malignant disease had been made.

The uterus was found to be large, soft, and to lie very much forward, and the sound showed that the length of its cavity was 4 inches.

As there did not appear to be sufficient evidence to justify the diagnosis of malignant disease, the patient was advised to try what electricity could do for her relief. She did not

bear the current well. The internal electrode of platinum was attached to the positive pole.

October 29th, 1887, 40 ma. for 5 minutes.

November 1st, 80 ma. 3d, 80 ma. 5th, 120 ma. for 5 minutes each. For the first time for a year there had not been any discharge for twenty-four hours. 8th, 100 ma. for 5 minutes. The discharge has begun again, and the patient does not feel as well as she did a couple of days ago. 10th, 100 ma. 12th, 80 ma. 15th, 80 ma. 17th, 40 ma. for 5 minutes each. The discharge is more viscid to-day. 19th, 60 ma. 22d, 60 ma. 29th, 90 ma. for 5 minutes each. Gaiffe's galvanometer was used to-day. There is rather less discharge, and the lady feels somewhat stronger.

December 1st, 70 ma. 3d, 80 ma. for 5 minutes each. There is less discharge, and the patient is feeling decidedly better and has more strength. 8th, 75 ma. 10th, 100 ma. for 5 minutes each.

The discharge continues to diminish in quantity, and as the patient feels that she is steadily gaining ground, she wishes to stop treatment, which has been, on account of her nervous state, rather a trial to her.

The subsequent history we have been unable to learn. We had neither taken her name nor address.

Case LIII.—Married, age 32; came to Edinburgh in November, 1887.

Patient was married a year ago, and about the same time a lump, which is steadily increasing in size, was noticed in the abdomen. Menstruation began at the age of 14, and has been always profuse and painful. Of late years there has been decided improvement in the amount of pain, but the quantity of discharge is increasing, and large clots are passed. It is only lately that the menorrhagia has begun to affect the general health.

On examination, the tumor is found to be prominent and to extend up to the umbilicus. The cavity is very wide, and the sound enters to a depth of 8½ inches.

Eighteen negative applications were made.

November 1st, 1887, 60 ma. 3d, 50 ma. 5th, 70 ma. 8th, 80 ma. 10th, 70 ma. 12th, 80 ma. 15th, 80 ma. for 5 minutes each. There is little difference in the size of the tumor, but the patient thinks that she feels somewhat better. 17th, 80

ma. 19th, 120 ma. 26th, 150 ma. for 5 minutes each. There has been much less hemorrhage this time, and only two clots. The patient feels much better than usual. Gaiffe's galvanometer used. 29th, 160 ma. for 5 minutes.

December 1st, 140 ma. 3d, 150 ma. 6th, 70 ma. for 5 minutes each. There has been some pain in the tumor, and the current was not well borne to-day. 8th, 100 ma. for 5 minutes. The pain is gone. 10th, 175 ma. 13th, 175 ma. 15th, 200 ma. for 5 minutes each. Patient has to go home in the mean time. The pain is quite gone, and she feels very well. The tumor is smaller, but not markedly so.

Case LIV.—Married, age 34; was seen with Dr. Scott, of Musselburgh, in November, 1887

The lady has not felt well for a number of years, and has suffered much from menorrhagia, from constant pain in the back, and from difficulty in walking; symptoms severe enough to prevent her having much pleasure in her existence.

On examination it was found that the pelvis was filled with a fibroid tumor of the uterus. Twenty-six positive applications were made.

November 8th, 40 ma. 10th, 40 ma. 12th, 80 ma. 15th, 80 ma. 17th, 80 ma. 19th, 80 ma. 22d, 60 ma. 24th, 80 ma. for 5 minutes each.

December 1st, 80 ma. for 5 minutes. The period is over; there was more discharge, and the pain was more aggravated than usual. 3d, 100 ma. 5th, 80 ma. 8th, 85 ma. 10th, 95 ma. 13th, 100 ma. 15th, 100 ma. 17th, 110 ma. for 5 minutes each. There is now decidedly less pain in the back, and the lady can walk better. 20th, 135 ma. 27th, 110 ma. for 5 minutes each. The period is over; there has been a marked improvement, both in the quantity of discharge and in the amount of pain. 29th, 110 ma. 31st, 120 ma. for 5 minutes each.

January 3d, 1888, 120 ma. 5th, 125 ma. for 5 minutes each. There is almost no pain, and in every respect the patient feels that there is a great improvement. 7th, 130 ma. 10th, 110 ma. for 5 minutes each. The patient has been going about a great deal, she says, and there has been more of the backache. 12th, 130 ma. for 5 minutes. The patient is again much better. 14th, 125 ma. for 5 minutes.

On February 5th, 1889, Dr. Scott writes, "She is fairly well,

the fibroid has remained quiescent, and there has been no hemorrhage since you kindly treated her."

Case LV.—Married, age 28; came to the Woman's Dispensary, Edinburgh, for the electrical treatment in November, 1887.

This patient had never been strong, and had suffered from dysmenorrhœa all her menstrual life—the pain being worst on the third day. Some two years before, she had been admitted into the ward of one of the obstetric physicians of the Edinburgh Royal Infirmary, on account of floodings. While in the ward she was pressed to allow the removal of the ovaries; but a sister, whose ovaries had been removed some years before, persuaded her to go home for a time. She was then admitted into the special ward for the treatment of ovarian disease in the infirmary. The patient was much emaciated, and no palpable disease of the ovaries or uterus could be detected; but as there was a copious discharge of blood from the bowel she was sent to the medical house; after a few weeks she quickly recovered and was discharged. After that time I saw her once or twice. She kept fairly well, and month by month the menstrual loss became less, until June, 1887, when she again began to lose too much. There began to be also a constant feeling of weight and pressure on the bladder, and the health began to fail. When I saw her in October there was a swelling attached to the right side of the uterus, falling forward and pressing on the bladder, the size of a small hen's egg. It was so exquisitely tender that one would have been inclined to think that it was an enlarged and inflamed ovary, had it not been possible to feel both those glands. On account of the general debility, and more especially from the great tenderness, I was loth at first to try electricity for fear that the simple passage of the sound might do harm; but after using hot water and glycerin pads with absolutely no improvement, I thought it best to attempt cure by this means before advising operation. The pain on passing water was said to be excruciating, and often lasted for hours. From her appearance there could be no doubt that she was a great sufferer. The treatment was begun on the 9th November, 1887. At that date the uterus was large, and pushed upward and toward the left by a tender mass on the right side connected with the fundus, about the size of a flattened-out cricket ball.

The upper margin was 4 inches above the pubes. The uterine cavity measured 3½ inches. The sound was connected to the positive pole, and on the 9th, 11th, 14th, and 18th November a current of about 40 ma. was allowed to flow for 3 minutes. The period came on after these four applications. There was more flow and more pain.

November 28th, 40 ma. for 4 minutes.

December 2d, 45 ma. for 4 minutes.

February 1st, 50 ma. for 4 minutes. 6th, 50 ma. 10th, 60 ma. 13th, 45 ma. 17th, 45 ma. 20th, 40 ma. 22d, 50 ma. for 5 minutes each. Although there has been and still is a great deal of pain, it is slowly becoming less. The tumor is smaller and more easily handled. 24th, 65 ma. for 5 minutes.

March 2d, 60 ma. for 5 minutes. For a few days before the period, which is just over, there was very decidedly less pain; but during the flow the pressure on the bladder was said to be "terrible." 5th, 60 ma. 7th, 70 ma. 9th, 80 ma. 12th, 75 ma. 14th, 40 ma. for 5 minutes each. For the first time for many months she was entirely free from pain all day yesterday. The tumor is not half the size it was. 19th, 50 ma. 21st, 40 ma. 23d, 100 ma. 26th, 100 ma. 28th, 100 ma. 30th, 110 ma. 31st, 85 ma. for 5 minutes each.

April 4th, 55 ma. for 5 minutes. The period is over. There has hardly been any of the bladder pain which was so bad last time. A natural period as regards quantity. 5th, 100 ma. 6th, 110 ma. for 5 minutes each.

In all, thirty applications, the positive electrode being always in the uterine cavity.

There was little tumor remaining; there was little pain; there was not any menorrhagia; and there was marked improvement in the general health and spirits.

In September we heard, through a sister, that the patient had left Edinburgh, but had been very much better, and had simply a little pain every month.

Case LVI.—Married, age 42; came to the Woman's Dispensary, Edinburgh, on November 11th, 1887.

She had enjoyed the best of health until her sixth and last child was born, seven years before. The labor had been easy, nor had there been any difficulty on the five previous occasions. For those seven years she has been "ill altogether," and suffered from constant and severe pain in the back and

left side, aggravated every month at the time of the periods. Two years ago she first noticed a lump in the abdomen, but in spite of this she had undergone a variety of treatment for displacement, no one apparently putting his hand on the abdomen until she was seen by Dr. Richardson, who sent her to the dispensary.

Her greatest distress, at the present time, is caused by irritability of the bladder, so great that she is never comfortable for two minutes together. For months she has been up at nights never less often than five times, and during the day is unable to retain more than a tablespoonful of urine at one time. The act of micturition is also accompanied by a very considerable amount of pain. In addition to this most distressing symptom, there is constant pain in the back and sides, and difficulty in walking, due to a terrible feeling of weight and dragging in the pelvis. Latterly the loss of blood every month has been considerable. She is totally unable to take care of her husband, her children, or her house, and has become nervous, irritable, and low-spirited. Fifteen months after this date, when she was well, she told me that she used to become so melancholic before the periods that she felt afraid that she might some day do away with herself. The poor woman has also been unable to sit in a chair for a long time. She looked utterly miserable and depressed.

On examining the abdomen, a mass rising out of the pelvis and extending to within two inches of the umbilicus was felt with the greatest ease, as the abdominal wall was much emaciated. The cervix was found to be somewhat in front of its natural position, and to be connected with the tumor which had been felt in the abdomen. Posteriorly, the pelvis was filled with another fibroid growth, which distended the posterior fornix. This explains the displacement theory—although the direction of the cervix, etc., showed that the body of the uterus did not lie backward even before the sound had been passed. The uterine cavity measured rather more than 5 inches, and could be measured without any difficulty.

Treatment.—The mass posterior to the cervix was punctured to the depth of nearly half an inch with an insulated steel needle the thickness of a No. 2 catheter (English scale). This was done on the 11th, 14th, and 21st November, and a current of electricity of probably from about 60 to 120 ma.

was passed from the abdomen for five minutes. The result of even the first of these applications was almost magical, for at her second visit on the 14th she looked marvellously better; she had lost a great deal of her worn and irritable expression; she had been able to sit on a chair without pain; she had been up but once every night, and could hold her water until the bladder contained a cupful during the day, and then empty it without pain or discomfort. Really the difference this one application made it is impossible to express, and hardly possible to believe, yet there appeared to be no difference in the physical condition. She menstruated after the second application with much greater comfort.

On the 25th and 28th of the month currents of 120 and 105 ma. were passed as before, except that no puncture was made, the internal electrode being the sound inside the uterine cavity.

December 2d, 130 ma. 5th, 120 ma. 9th, 110 ma. 16th, 75 ma. for 5 minutes each. Puncture was again made to-day. Both in the abdomen and also in the pelvis it was found that there was a marked diminution in the size of the growths.

January 6th, 1888, 110 ma. 13th, 125 ma. 16th, 155 ma. 20th, 130 ma. 25th, 155 ma. 27th, 145 ma. for 5 minutes each. The improvement during the month has been entirely satisfactory. She now sleeps all night without wakening. On pressing deeply in the abdomen no tumor can now be felt, and the uterine cavity measures 3 inches.

February 6th, 160 ma. 10th, 150 ma. 13th, 150 ma. 17th, 185 ma. 20th, 155 ma. 24th, 170 ma. for 5 minutes each. Feels always at her best on the day that she has treatment. The amount of blood lost at the period has been less.

March 2d, 80 ma. 5th, 220 ma. 9th, 125 ma. 12th, 130 ma. for 5 minutes each. For the last few days there has again been frequent desire to micturate, with discomfort, and accompanied by the presence of urates in the water. 19th, 160 ma. 21st, 150 ma. for 5 minutes each.

April 2d, 170 ma. for 5 minutes. On account of the bladder irritation, the positive pole was placed in the uterus, and the urethra was slightly dilated with a bougie on one occasion. 4th, 140 ma. 6th, 150 ma. for 5 minutes each.

A return was made to the negative pole in the uterus. The patient now feels almost quite well; there is very little pain, no bladder irritation, no sleeplessness; little difficulty in walk-

ing, and she can do and has been doing all her housework for the last two months.

Thirty applications in all were made. In twenty-three the internal pole was the negative sound in the uterine cavity, in four the negative needle in the tumor, and in three the positive sound in the cavity.

The local result was, that the uterus had returned to its natural size, and that there was a pediculated fibroid mass in the pouch of Douglas, not half as large as it had been before.

Condition on January 19th, 1889, nine and a half months after the last application. In a word, she is quite well, she has no pain, no difficulty in sitting nor in walking, no trouble with the bladder, and can pass water as well as she ever did in her life. There is not any menorrhagia, and the melancholic condition has disappeared. Occasionally there is a little headache. She said to me, "I was just thinking to-day how well I am. You don't know what you have done for me; I am in a different world altogether, and can do everything for myself."

Case LVII.—Married; was sent to Edinburgh by Dr. Napier, of Glasgow, in November, 1887.

The patient had been married for fourteen years, and had not had any family. She had enjoyed very good health until about fifteen months ago, when, on account of increased loss at the menstrual period, she was examined by Dr. Napier, who felt the tumor. Though this was growing rapidly, and the menorrhagia, accompanied by pain, was increasing, the patient would not have any but ordinary treatment, until she became alarmed by an attack of peritonitis, which confined her to bed for three weeks. On her recovery she came through to Edinburgh. The tumor extended upward to the level of the umbilicus.

Thirty negative applications were made in twelve weeks.

November 15th, 1887, 40 ma. 17th, 65 ma. 19th, 80 ma. for 5 minutes each. The tumor has begun to diminish in size. 22d, 85 ma. 24th, 90 ma. 26th, 115 ma. for 5 minutes each. The patient does not feel very comfortable to-day. Gaiffe's galvanometer was used. 29th, 75 ma. for 5 minutes.

December 6th, 85 ma. for 5 minutes. The menstrual flow is over; there has been more discharge than usual and less pain. 8th, 100 ma. 10th, 100 ma. 13th, 120 ma. 15th, 135 ma. 17th, 100 ma. for 5 minutes each. There is some pain in

the tumor to-day; not severe enough to prevent the patient coming for treatment. 20th, 135 ma. for 5 minutes. The pain, which was complained of three days ago, was dissipated by the passage of the current. 22d, 140 ma. 24th, 120 ma. for 5 minutes each.

January 3d, 1888, 110 ma. for 5 minutes. The patient has been home for Christmas, and while there had a very satisfactory period. 5th, 115 ma. 7th, 145 ma. 10th, 125 ma. 12th, 150 ma. for 5 minutes each. The tumor is very much smaller, is quite movable from side to side, and the abdomen is now quite flat. 14th, 100 ma. 17th, 150 ma. 19th, 135 ma. 28th, 125 ma. for 5 minutes each. There has been rather more discharge than at the last period. The patient feels well. 31st, 135 ma. for 5 minutes.

February 2d, 135 ma. 4th, 145 ma. 7th, 130 ma. 9th, 130 ma. for 5 minutes each.

The tumor is not half the size it was; instead of filling the lower half of the abdomen, it can now be felt with some little difficulty as a loose, movable body.

September.—Heard that the patient was very well, and that the tumor had got smaller since she was last seen in February.

Case LVIII.—Married, age 33; was sent into the Royal Infirmary, Edinburgh, by Dr. Morgan, of Sunderland, in May, 1886.

The patient had been suffering for the past five years from the effects of excessive losses of blood at the monthly periods. For the same length of time she had been aware of the presence of a tumor in the abdomen.

On examination, the tumor was found to extend to midway between the pubes and the umbilicus, and to be situated rather more on the left than on the right side. The pelvis was packed with the mass, which extended on both sides to the pelvic wall, and filled up the entire hollow of the sacrum. It was evident that the tumor itself could not be removed, so it was agreed to take away the ovaries, if possible. The left one was to be felt high up on the side of the tumor. On the right side there was a tender spot, but no trace of ovary could be found.

The operation was performed on the 24th May in the presence of Dr. Morgan, Dr. Price, of Philadelphia, Dr. Hodsdon,

and others. There was a layer of 1 inch of fat on the abdominal wall. The omentum was found to be spread out over the tumor, and to be adherent to it, and with some difficulty the left ovary was got hold of. The incision was enlarged, and it was drawn well into view. The ovary appeared to be fairly healthy, and the tube was dilated to about the size of one's thumb. The broad ligament was transfixed as close to the uterus as possible, tied, and the parts removed. The right ovary was found to be situated deeply in the pelvis inclosed in the layers of the broad ligament. By drawing up the tumor and then throwing the light into the pelvis by means of the reflector, it was seen where the ovary was. Running over it toward the bladder, which was drawn up and displaced to the right side, the ureter was detected. Under the circumstances it was thought best to make no attempt at removal. The patient went home in three weeks.

November, 1887.—The patient has come back for the electrical treatment. At first, after the operation, there was a decided improvement, but for some months she has had severe losses of blood, lasting for a week, and recurring after another week's interval. She is now more anæmic and weak than she was before the operation in 1886. The tumor is both larger and harder, and reaches up to the level of the umbilicus. A sound passes $6\frac{1}{2}$ inches.

The treatment consisted in thirty-six positive applications.

November 15th, 35 ma. 17th, 40 ma. 19th, 65 ma. 24th, 65 ma. for 5 minutes each. The period has been much as usual, except that it was one day shorter, and she was in bed for four days only. 26th, 125 ma. for 5 minutes. Gaiffe's galvanometer was used to-day. 29th, 110 ma. for 5 minutes.

December 1st, 125 ma. 3d, 150 ma. 6th, 175 ma. 13th, 165 ma. for 5 minutes each. The period has not been any worse than the last one. The interval was twelve days, a gain of five. 15th, 220 ma. 17th, 160 ma. 20th, 200 ma. 22d, 200 ma. 24th, 125 ma. 28th, 160 ma. for 5 minutes each. The patient's husband has been to see her, and says that he notices a great difference in her strength and appearance. 30th, 160 ma. for 5 minutes.

January 12th, 1888, 200 ma. for 5 minutes. After an interval of eighteen days, the third period since the treatment

was begun came, and was very much the same as the last two. 14th, 155 ma. 17th, 140 ma. 19th, 165 ma. 21st, 165 ma. 24th, 170 ma. 26th, 175 ma. 28th, 175 ma. for 5 minutes each.

February 4th, 170 ma. for 5 minutes. There was a marked improvement in the menstrual flow this time. The interval was two days shorter than the previous one; but the quantity of discharge was very much less, and the patient had to keep in bed for only one day. The tumor is more movable, and its upper line is an inch below what it was. 7th, 130 ma. 9th, 175 ma. 11th, 215 ma. 16th, 130 ma. 18th, 120 ma. 23d, 110 ma. for 5 minutes each.

March 1st, 140 ma. for 5 minutes. A perfectly natural period has been got over, during which the patient did not require to go to bed. 3d, 140 ma. 6th, 190 ma. for 5 minutes each.

The tumor is now 2 inches below the umbilicus and is more lobulated. The patient says that she feels well and strong.

On June 11th, 1889, Dr. Morgan wrote: "She is looking a great deal better, and has lost the anæmic appearance which she had. She says that there has been no flooding for twelve months. She is quite regular in her periods, and the discharge is natural and painless; and this has been the case since about four months after the ceasing the treatment. The tumor is much the same as when I last examined her—a large globular mass, tender in parts on pressure and as big as a five-months' pregnant uterus. Mrs. M. had just been changing her residence when I called, and I found her working. She says she has no more difficulty than she had seven years ago when her trouble first commenced, and can work all day without distress."

Case LIX.—Married, age 46; came to Edinburgh in November, 1887.

Eleven years ago this lady consulted Dr. Keith on account of a bleeding fibroid tumor. Until three years ago, the bleeding became more and more profuse and very painful. About this time a mass of tumor was passed per vias naturales, and there has been some amelioration of the symptoms since then. The periods last ten, eleven, or twelve days, and the discharge is very great. They recur at regular intervals of four weeks, the patient thus being clear for between a fortnight and three weeks. There is constant pain in the right side.

The tumor is found to extend up to the umbilicus, and is

decidedly prominent. The cavity measures 5 inches. The patient is soft and anæmic.

November 22d, 95 ma. 25th, 100 ma. 28th, 125 ma. 29th, 165 ma. for 5 minutes each.

December 13th, 130 ma. for 5 minutes. The period has been rather better than usual. 15th, 115 ma. 17th, 120 ma. 20th, 250 ma. 22d, 250 ma. 24th, 200 ma. 26th, 85 ma. for 5 minutes each.

January 7th, 1888, 210 ma. for 5 minutes. A specially bad period is over. 10th, 130 ma. for five minutes. 12th, 14th, 17th, and 19th, 175 ma. for 5 minutes. Is at last beginning to feel a little better and stronger. 21st, 160 ma. 31st, 200 ma. for 5 minutes each. The period has not been quite so bad as the last.

February 2d, 200 ma. 4th, 200 ma. 7th, 175 ma. 9th, 150 ma. 11th, 170 ma. 23d, 200 ma. for 5 minutes each. The period lasted but three days; there was little discharge, and the patient feels well. 25th and 28th, 150 ma. for 5 minutes.

March 1st, 160 ma. 3d, 150 ma. for 5 minutes each. As there had been little diminution in the size of the tumor, the sound, instead of being made positive, as it had been up till now, was made negative. 6th, 170 ma. 13th, 130 ma. for 5 minutes each. The period has been got over a week too soon. It was bad for only two days. 15th, 17th, and 20th, 150 ma. for 5 minutes. 22d, 165 ma. 24th, 160 ma. 26th, 160 ma. for 5 minutes each.

Since beginning the use of the negative pole inside the uterine cavity, there has been a marked lessening of the bulk of the tumor, and it is now not much more than half the size it was in November of last year.

Case LX.—Married, age 51; came to the Woman's Dispensary, Edinburgh, on the 28th November, 1887.

She has had three children and three mishaps, the last having taken place ten years ago. The death of one of her three sisters was caused by the presence of an abdominal tumor. Little information could be got about this tumor, except that it had not caused any hemorrhage.

The patient herself is fat and anæmic. She says that two years ago she began to lose too much at her periods, but thought little of it until six months ago, when she felt that the increased loss of blood was beginning to tell seriously on

her health. Now she feels that she can work no longer, and, if nothing can be done, that she must give up her situation of a Bible-woman. Some years ago the periods lasted five days; the usual length is now two weeks, and the last one continued for three weeks. In addition to the increasing debility, there is great feeling of heat and itching in the vagina.

On examination, a firm, smooth tumor, situated exactly in the centre of the lower part of the abdomen, was to be felt reaching up to within 1½ inches of the umbilicus. The cervix was in its natural position, and the sound passed easily to a depth of 7 inches. There was nothing seen in the vagina to account for the irritation.

Treatment.—7 inches of the sound attached to the positive wire were exposed, and the instrument inserted into the uterine cavity.

November 28th, 70 ma. for five minutes.

December 2d, 90 ma. 5th, 85 ma. 9th, 85 ma. 12th, 60 ma. 16th, 100 ma. for 5 minutes each.

January 6th, 1888, 140 ma. for 5 minutes. The irritation in the vagina has entirely disappeared, and there has not been any hemorrhage from the uterus for eight weeks. 23d, 105 ma. 27th, 100 ma. 30th, 125 ma. for 5 minutes each. The period came on on the 7th, and lasted fourteen days. To-day she says that she has not felt so well for about a year.

February 5th, 100 ma. 8th, 105 ma. 10th, 120 ma. 13th, 100 ma. for 5 minutes each. To-day she feels fit for work, and said, "I can do up my fireside in a different way." 17th, 165 ma. 20th, 240 ma. for 5 minutes each. Is now 8 inches less round the middle than she was three months ago. She can now button her boots, a thing she has not been able to do for eighteen months. 22d, 210 ma. 24th, 195 ma. 27th, 225 ma. 29th, 210 ma. for 5 minutes each. Felt so well that she did a washing yesterday, but is not any the better to-day for doing it.

March 2d, 225 ma. 5th, 220 ma. 7th, 210 ma. 9th, 150 ma. for 5 minutes each. As the period has been due for ten days, and as, in consequence, there is considerable feeling of fulness and discomfort, the wire from the negative pole of the battery was on this and all subsequent occasions attached to the sound in the cavity of the uterus. 12th, 240 ma. 14th, 235 ma. 19th, 250 ma. for 5 minutes each. A natural period, lasting four

days, has given great relief. 21st, 225 ma. 23d, 240 ma. 28th, 225 ma. 30th, 245 ma. 31st, 240 ma. for 5 minutes each.

April 2d, 240 ma. 3d, 250 ma. 6th, 225 ma. for 5 minutes each.

Thirty-five applications in all—twenty-three positive and twelve negative. Patient feels quite well, and the tumor is not larger than half the size it was before the treatment was begun. In September was quite well, and able to do anything as well as she ever could in her life.

Case LXI.—Single, age 41 ; was sent to Edinburgh by Dr. Bannerman from Hawick, and was treated at the Woman's Dispensary.

Eight years ago she had seen Dr. Keith on account of a small fibroid tumor of the uterus which had been accidentally discovered. It was at that time giving rise to no symptoms, and she was advised to leave it alone, unless it began to give trouble. For some years the tumor did not affect her in the slightest degree; but lately it has been growing more rapidly, and the patient has become very breathless, partly due to the pressure upward of the mass, but principally on account of anæmia. This anæmia is due to a very considerable augmentation in the quantity of blood lost while menstruating, the periods lasting eight or ten instead of four days, and to the drain of a constant leucorrhœal discharge.

On examination, a softish tumor of probably 14 or 16 pounds in weight was felt filling the abdomen and distending the flanks very considerably. On the right side it reached up to the ribs; on the left it was about one finger's breadth below their margin. The cavity measured 4 inches.

The treatment consisted as usual in the passage of the electrical current through the tumor. The negative electrode was always placed in the uterine cavity.

November 30th, 1887, 60 ma for 5 minutes.

December 5th, 90 ma. for 5 minutes. Has begun to take steel drops. 7th, 65 ma. 9th, 150 ma. for 5 minutes each. The tumor is decidedly smaller, and the patient says that "she feels fine." 12th, 140 ma. 14th, 135 ma. 16th, 140 ma. 19th, 130 ma. 22d, 110 ma. for 5 minutes each.

January 6th, 1888, 200 ma. for 5 minutes. The tumor is much smaller; it does not reach to within three fingers' breadths of the costal margin on the left side. The menstrual

loss has been much less, and she feels better. 8th, 190 ma. 10th, 210 ma. 13th, 80 ma. for 5 minutes each. For some reason, which was not evident, the application was badly borne to-day. 16th, 155 ma. 18th, 180 ma. 20th, 205 ma. 23d, 150 ma. for 5 minutes each. Is not so breathless, and has a little more color. Has begun to take a few drops of liquor arsenicalis along with the iron. 25th, 155 ma. 27th, 110 ma. 30th, 120 ma. for 5 minutes each.

February 1st, 155 ma. 3d, 150 ma. 6th, 150 ma. 8th, 100 ma. 10th, 100 ma. 13th, 100 ma. 17th, 165 ma. 20th, 125 ma. 22d, 140 ma. for 5 minutes each. There were twenty-nine applications of an average strength of 136 ma.

The breathing has been steadily improving, and there is now little shortness of breath. The patient feels and looks very well, and the tumor has diminished in size very much. It does not extend outward on either side as far as the iliac spine, and its upper margin is barely above the umbilicus.

Dr. Bannerman wrote on the 11th July, 1888, "With regard to Miss ——, I do not think that there is any alteration in size, although it has certainly ceased growing since she left your care. Menstruation is regular, although the quantity is smaller and pale in color. Her general health is below par."

Case LXII.—Single, age 45; was sent to Edinburgh to have a tumor removed, which was supposed to be ovarian, in the beginning of December, 1887.

The history of this case was obscure, and the tumor was noticed only a few weeks ago. For twelve years there has been a watery discharge, and there has been a great deal of abdominal pain for a year. This pain is becoming steadily worse. There is not any menorrhagia.

The patient was a tall woman, with a peculiar brownish complexion. She was much emaciated, and this symptom had been marked comparatively recently. On examining the abdomen, the skin was found to be tightly stretched over a very large prominent tumor, which extended up under the costal margins at both sides. The tumor itself was extremely soft, and must have weighed from twenty to thirty pounds. An ordinary Duncan's sound could be passed for its whole length into the cavity. The tumor was evidently uterine, and possibly malignant.

December 8th, 60 ma. for 5 minutes. The passage of the

sound started a very brisk hemorrhage. 10th, 150 ma. 13th, 250 ma. 17th, 260 ma. 20th, 250 ma. for 5 minutes. At the first four applications the sound was made positive; to-day it was negative. The patient complains of pain in the back of a neuralgic character. This pain wakes her about four o'clock in the morning, and lasts for ten or twelve hours. It is not any better nor any worse after the applications. There is less watery discharge. 22d, 230 ma. 24th, 250 ma. for 5 minutes each. 29th, 300 ma. for 8 minutes. The lady has had a slight feverish attack. The tumor is immensely smaller, and the breadth of the hand can be placed between it and the ribs on the right side. 31st, 210 ma. for 5 minutes.

January 3d, 1888, 225 ma. 5th, 260 ma. for 5 minutes each. 7th, 275 ma. for 10 minutes. There has been less pain, and it does not begin so early in the morning, and does not last so long. 10th, 275 ma. for 10 minutes. 12th, 275 ma. for 7 minutes. 14th, 300 ma. for 10 minutes. There is now little pain. The lady says that she feels stronger, and that she can walk with more ease and comfort. 17th, 310 ma. 19th, 300 ma. for 10 minutes each. An increase in the pain to-day. 21st, 290 ma. for 10 minutes. 24th, 300 ma. for 8 minutes. 26th, 290 ma. 28th, 275 ma. for 12 minutes each. 31st, 290 ma. for 10 minutes. There is again less pain.

February 2d, 300 ma. 4th, 275 ma. 7th, 300 ma. 9th, 275 ma. 11th, 275 ma. 14th, 275 ma. 16th, 275 ma. 18th, 250 ma. for 10 minutes each. Until yesterday there had been a gradual lessening of the pain. To-day it is again severe. 23d, 250 ma. for 10 minutes. The sound was made positive. 25th, 225 ma. for 10 minutes. The pain was decidedly better yesterday; to-day it is as bad as ever. 26th, 250 ma. for 10 minutes. Less pain. 28th, 250 ma. for 10 minutes. The pain is again severe. The tumor is very much smaller, but the pain has prevented much, if any, improvement in the general condition. Quinine in large doses and other drugs gave no relief.

In September the lady was seen by the nurse, who found her at that time much improved, with the tumor continuing to diminish, with little pain, but still profuse leucorrhœa. When she was written to, as we had heard nothing of her for some months, the sister wrote to say that she had died in April, 1889, but did not give any indication of what had been the cause of death.

Case LXIII.—Married, age 38; was sent by Dr. Brumell, Morpeth, in December, 1887.

The history was as follows: About three years ago the patient began to lose too much blood at the periods, and to have in addition intermenstrual discharges. This went on for a year without there being much pain or discomfort. Pain of a bearing-down character then began to be felt, and was described as being terrible. At first it came only with the periods, but for some time it has been constant, and her friends say that she often suffered dreadfully. The bleedings, for the past year or eighteen months, have been most alarming; and during them the patient has had to lie absolutely quiet in bed, as the slightest movement would bring on a great rush of blood. For a long time she has been unable to walk, and for the last six months there has been great difficulty in keeping down food. For some months the discharge has been most offensive, and it has been difficult to remain in the same room with her. For a fortnight the catheter has been required, as the patient has been unable to pass water.

When the patient arrived in Edinburgh on the 7th of December, she appeared to be dying of blood-poisoning. On entering the room the smell was most offensive. She was emaciated, she was vomiting, and her general appearance was very bad. She looked as if she would not live more than a few weeks. On examining the abdomen, a large, prominent tumor extending to 2 inches above the umbilicus was felt. It was not possible to make a vaginal examination, as a sloughing mass of tumor filled the passage and extended for fully a couple of inches outside. The mass of tumor had evidently distended the cervix to its fullest extent. It was dying, and was poisoning the patient. The operation of enucleation did not present much hope, if any, of a satisfactory result, more especially as the patient had a small pelvis; but as the lady was certain to die soon if nothing were done, it was thought fair to experiment on her with electricity.

December 9th, 60 ma. for 5 minutes. The central part of the mass, situated outside the vagina, was punctured to the depth of half an inch, and the needle made negative. 11th, 275 ma. 13th, 190 ma. for 5 minutes each. 15th, 250 ma. for 8 minutes. There is already a great improvement; the patient can now pass her water; there is less smell, and the tumor

has receded into the vagina. 21st, 200 ma. for 8 minutes. There has been a menstrual period, with less pain and less flow than usual. 23d, 250 ma. for 8 minutes. 25th, 260 ma. for 15 minutes. 27th, 250 ma. for 10 minutes. Is feeling greatly relieved, and the tumor is smaller below. 28th, 240 ma. for 10 minutes. 30th, 230 ma. for 12 minutes. The effect of the puncture and the passage of the electrical current seems to have been to concentrate the sloughing at one spot, and to render healthy the surrounding parts of the tumor, which were previously in a dying condition. A piece of slough came away to-day. The general state of the patient is much improved, and she has lost the pyæmic appearance which she had two or three weeks ago.

January 1st, 1888.—250 ma. 3d, 240 ma. for 15 minutes each. 7th, 250 ma. for 10 minutes. The period has lasted for one day only. There has not been any vomiting nor feeling of sickness for fully a week, and the patient says that she feels much stronger, though still unable to walk more than a few yards. 10th, 260 ma. 12th, 240 ma. 14th, 260 ma. 17th, 240 ma. 19th, 240 ma. for 10 minutes each. 21st, 245 ma. for 12 minutes. There has been a return of the bearing-down pain, and some small pieces of slough have come away. 24th, 255 ma. 28th, 240 ma. for 10 minutes each. A slight period is again over. The tumor is smaller and flatter above, and is a couple of inches within the vagina. 31st, 325 ma. for 10 minutes.

February 2d, 230 ma. 7th, 235 ma. for 10 minutes each. Gave chloroform two days ago and removed a large slough, which has given rise to considerable smelling discharge. To-day there is scarcely any smell. 9th and 11th, 230 ma. for 10 minutes. 14th and 16th, 225 ma. for 10 minutes. Several sloughs the size of the finger have come away. The patient feels well. 18th, 21st, 23d, and 25th, 225 ma. for 10 minutes. 28th, 230 ma. for 10 minutes.

March 1st, 225 ma. for 10 minutes. The period came on, with great pain and retention. 9th, ether; several sloughs were removed. It was never possible to attempt the removal of sloughs, except while the patient was anæsthetized, as the vagina was so tender that it was always even difficult to get the needle into the tumor. 29th, 225 ma. for 30 minutes. 31st, 210 ma. for 20 minutes.

April 2d and 4th, 260 ma. for 20 minutes. 6th, 260 ma. for 15 minutes. The patient is now immensely better in every way. There has been less pain, less menstrual discharge; no intermenstrual discharge; no blood-poisoning; lessening in size of the tumor, and great improvement in the health and strength. Instead of causing the tumor to slough, it has almost stopped this process. Certainly without electricity the patient would have been dead months ago.

The lady came up to town in the end of May, and said that during the last two months she had been very well, and there had not been a period.

June 1st, 200 ma. for 5 minutes. 4th, 8th, and 11th, 200 ma. for 10 minutes. Is very well, and is able to be out in the park every day. Some large sloughs have come away. 13th, 220 ma. for 5 minutes. 15th, 225 ma. 16th, 210 ma. 18th, 170 ma. 20th, 170 ma. 22d, 170 ma. 23d, 150 ma. for 10 minutes each. 24th, a large slough was removed. 29th, 150 ma. for 10 minutes. The platinum-pointed sound was pushed well into the mass.

July 1st and 2d, 150 ma. for 10 minutes. 4th, 250 ma. 6th, 270 ma. for 10 minutes each. The water had to be drawn off yesterday, as the urethra had become blocked by the descent of the tumor. It has gone up again to-day. 7th and 11th, 200 ma. for 10 minutes. The period has lasted but two days. The sound was pushed to a depth of 6 inches into the tumor. 16th, 150 ma. for 10 minutes. 19th, 20th, and 21st, 125 ma. for 10 minutes. 24th, removed a mass of dry, firm slough.

August 1st, 13th, and 16th, 100 ma. for 5 minutes. 20th and 23d, 100 ma. for 10 minutes. 25th, again removed a mass of slough.

September 2d, 100 ma. 4th, 100 ma. 5th, 100 ma. 7th, 150 ma. 9th, 100 ma. 10th, 100 ma. 12th, 100 ma. 17th, 100 ma. 18th, 100 ma. 20th, 125 ma. 21st, 100 ma. 22d, 100 ma. 24th, 100 ma. 26th, 100 ma. for 10 minutes each. After great bearing-down pain a mass of tumor, the size of a fœtal head, was extruded from the vagina, and was removed under chloroform.

October 12th, 13th, 15th, 16th, 18th, 19th, 20th, 22d, 23d, and 24th, 100 ma. for 10 minutes. The tumor has again come low down, but does not project beyond the vagina. It has now the appearance of an ordinary healthy submucous fibroid, and it is worthy of note that the electrical treatment has stopped

the sloughing and putridity of the growth, and instead of causing blood-poisoning, has been the means of curing it. 26th, 29th, 30th, and 31st, 100 ma. for 10 minutes.

November 2d, 3d, 5th, 9th, 10th, 13th, 14th, 15th, 23d, 24th, 26th, 28th, and 30th, 100 ma. for 10 minutes.

December 1st, 3d, and 5th, 100 ma. for 10 minutes.

Three attempts to remove the tumor entirely have been made since the sloughing ceased, but on account of the narrow pelvis and the great vascularity of the growth this was not accomplished.

The patient is at present at home in the country, and is to return when the tumor begins to give rise to any trouble. There were not more than two or three periods during the whole course of the treatment, but since she has been at home they have been coming regular and of normal quantity, and are not accompanied by pain.

Case LXIV.—Single, age 34.

December, 1887.—The patient has known of a swelling in the abdomen for the past two and a half years, which has in itself given her little inconvenience, and there has not been any menorrhagia. For some months, she has been much troubled by sickness, and says that she vomits all the food she takes in the forenoon.

On examination a tumor is felt, which extends up to the level of the umbilicus, and which is almost entirely confined to the left side of the abdomen. It is also felt in the pelvis, and continuous with the uterus. The uterine cavity is not enlarged.

December 13th, 15th, and 17th, 115 ma. for 5 minutes. 20th, 130 ma. for 5 minutes. The four applications were made with the sound negative. The patient was not heard of for some little time, and when she returned she said that she had not been feeling well. She was feverish, and there was an increase of swelling in the pelvis, though the abdominal swelling had much decreased in size. As she was not comfortable at home she was admitted into the Royal Infirmary. For some weeks the temperature kept up, usually from 100° to 102°, with pulse 110 to 120. She was kept quiet in bed and gradually improved, and was able to leave hospital in good health, and with scarcely a trace of tumor to be found.

Case LXV.—Single, age 39; was brought by Dr. Struthers, of Leith, in the beginning of January, 1888.

This patient says that for nearly twelve years she has lost more blood during her menstrual periods than she had done for the few years before that time; but it was not until four and a half years ago that the bleeding came to be really excessive and severe enough to render it necessary for her to keep in her bed for a day or two every month. Some six months after this, a tumor was first noticed in the abdomen. For some years, there has been somewhat severe pain complained of, for the first few days of the menstrual flow. For the last two years all her symptoms have been much aggravated; the tumor has increased with great rapidity; the loss of blood every month has become very great, lasting for fourteen days, and so severe, that the patient has to lie in bed for at least one week out of every four, or in other words, for three months out of every year. The pain has become worse, and there is at all times, a most profuse white discharge. The general health has suffered greatly; there is marked anæmia, there is debility, there is breathlessness, and the feet and legs are swollen, even after lying in bed. The patient considers that she is more pulled down by the white than by the red discharge. No measurements were taken, but before treatment a 30-inch pair of stays could not be put on.

On examination the patient is seen to be a dark sallow woman, and markedly anæmic. The abdomen is filled and distended by a soft tumor of the uterus, which has raised up the ribs on both sides with the sternum. The uterine cavity was very large, a sound being passed to a depth of ten inches, and even then it did not meet with any obstruction.

The tumor was evidently a soft fibroid tumor of the uterus, but there were not any cysts to be felt.

The negative pole of the battery was at every sitting connected to the internal electrode.

January 4th, 1888, 100 ma. 7th, 150 ma. 10th, 150 ma. 12th, 200 ma. for 5 minutes each. The tumor is scarcely so tightly fixed above and is slightly movable. 14th, 235 ma. 17th, 200 ma. for 5 minutes each. The effect of the treatment is beginning to be felt in increased ease and comfort in walking. 19th, 250 ma. 21st, 350 ma. for 5 minutes each. She told us to-day that she had been able to put on a dress which was too tight to be worn, in the summer of last year. 24th, 200 ma. 26th, 250 ma. for 5 minutes each.

February 9th, 220 ma. for 5 minutes. The first period since the commencement of the treatment is over, and, although the quantity of blood lost was much the same as usual, it was not found necessary to stay in bed for longer than two days, instead of the usual seven. 9th, 300 ma. 11th, 260 ma. 14th, 250 ma. 16th, 300 ma. 18th, 225 ma. for 5 minutes each. The improvement, which was observed almost from the first, continues. The patient walks much more easily, and finds the most difference when ascending a hill. The tumor is undoubtedly smaller; there is a decided pit at the epigastrium, and the fingers can be pushed between the tumor and the ribs, although the mass is not below and clear of them yet. 21st, 255 ma. 23d, 300 ma. 25th, 230 ma. for 5 minutes each.

March 8th, 250 ma. for 5 minutes. During this, the second period, the loss has been greater than usual, and the patient has had to keep her bed for four days. 10th, 250 ma. for 5 minutes. Now she feels much more comfortable and stronger, and went out for a walk for pleasure yesterday, and can hardly believe that she did such a thing. She is now nearly free from one distressing symptom—she can sit with little discomfort. 13th, 210 ma. 15th, 170 ma. 17th, 180 ma. 20th, 250 ma. 22d, 225 ma. 24th, 210 ma. for 5 minutes each. In every way there is decided improvement; the patient eats and sleeps well; she walks more easily, has less pain, less leucorrhœa, and the tumor is smaller.

There were twenty-seven applications of an average strength of 228 ma.

In September the tumor was smaller. The patient was better in every way, and was confined to bed for three and a half days instead of seven or eight every month, and stated that she did not lose more during the whole of the last monthly flow than she often did in one day, a year ago.

January 21st, 1889.—The leucorrhœa has entirely ceased for the last six weeks. The legs swell a little toward night. The periods last seven days instead of fourteen, and the quantity of blood lost is not more than she used to have when twenty years of age, and she does not require to stay in bed. The tumor is smaller, the patient thinks, by one-half, though it appears to be scarcely so much, perhaps somewhere between one-third and one-half, and instead of its upper limit being indefinable on account of its being hidden by the chest wall, the

whole breadth of the hand can be placed between the ribs and the tumor. The patient says that she noticed that the mass is smaller after each period than it was after the one before. Since the tumor became so much smaller, and consequently so much more movable, there has been considerable dragging pain in both groins. This is, however, fortunately relieved by fixing the growth in one position by means of a tight pair of stays. Instead of being unable to fasten a 30-inch pair, she can now wear a 26-inch, and even then can push her hand between her clothes and the tumor.

Case LXVI.—Married, age 48.

The tumor was first noticed in 1885, and has much broken down the health of this patient. She had never been robust, and has been a martyr to dyspepsia for many years.

On examining the abdomen, a mass extending out of the pelvis and reaching to within 3 inches of the umbilicus was felt. From the vagina it was found that the pelvis was filled by this tumor. The cervix was fixed, and the uterine cavity measured 5 inches. The tumor is situated entirely in the anterior wall, and as the posterior wall is thin, and the sound therefore will be close to the rectum, there is almost certain to be pain when the electrical current is passed.

January 9th, 1888, 50 ma. for 5 minutes. There was a good deal of pain, as had been anticipated. The sound was made negative throughout the treatment. 11th, 80 ma. 13th, 100 ma. 16th, 90 ma. 18th, 100 ma. 20th, 100 ma. 23d, 100 ma. for 5 minutes each.

February 3d, 70 ma. for 5 minutes. There has been a somewhat greater flow than usual, and the lady feels less swollen and uncomfortable than she has done for a long time. 6th, 60 ma. 8th, 100 ma. 10th, 100 ma. 13th, 100 ma. 15th, 150 ma. 17th, 100 ma. 20th, 170 ma. 22d, 130 ma. for 5 minutes each. Is feeling better than she has done for some time.

March 2d, 150 ma. 5th, 150 ma. 7th, 70 ma. 9th, 125 ma. 12th, 80 ma. 14th, 170 ma. 16th, 120 ma. 21st, 180 ma. 23d, 170 ma. 31st, 170 ma. for 5 minutes each.

April 2d, 175 ma. for 5 minutes.

April, 1889.—There has been a slow but steady improvement in the general health.

Case LXVII.—Married, age 42; was sent by Dr. MacLeod, of Hawick, in January, 1888.

For the last seven years there has been a steady increase in the amount of blood lost at the monthly periods. The flow was continuous for ten days, and the patient has become very nervous and sleeps very badly. There is also almost constant pain, which at times is said to be fearful.

On examination, a tumor is felt to extend to three fingers' breadths above the pubes, and in the pelvis the cervix is felt to be large and to be situated far back. The sound passes to a depth of 5 inches.

The treatment consisted in twenty-eight applications, in all of which the internal electrode was made positive. The average strength of the currents was 133 ma.

January 13th and 16th, 1888, 100 ma. for 5 minutes. The patient was much upset by the first application, but is better again to-day. 18th, 100 ma. 20th, 115 ma. 23d, 120 ma. for 5 minutes each. The lady is very sleepless; she often gets up during the night and walks about her room for an hour at a time. 25th, 150 ma. for 5 minutes.

February 1st, 100 ma. for 5 minutes. The period has not lasted so long as usual, and there has been much less discharge. 3d, 115 ma. 6th, 125 ma. 8th, 130 ma. 10th, 130 ma. 13th, 130 ma. 17th, 120 ma. 20th, 120 ma. 27th, 150 ma. for 5 minutes each. There has been rather more discharge than usual. 29th, 140 ma. for 5 minutes.

March 2d, 145 ma. 5th, 160 ma. for 5 minutes each. Severe pain in the left side is complained of to-day. There has been more or less for a long time, but it had been gradually getting better since the treatment was begun. 7th, 155 ma. 9th, 130 ma. 12th, 150 ma. for 5 minutes each. The pain in the side is very much better. 14th, 165 ma. 16th, 130 ma. 19th, 150 ma. 22d, 180 ma. 28th, 150 ma. for 5 minutes each. The period has been in every respect greatly improved; it lasted a shorter time, there was less discharge, and much less pain. 30th, 160 ma. for 5 minutes.

April 2d, 110 ma. for 8 minutes.

Extract from letter, dated 17th March, 1889: "I am very well and have kept well all the time; of course I get tired at times, and feel my side a little, but I expect this is all right. I feel very thankful to you for your clever treatment of me. Had you been in Edinburgh I would have called to see you and hear what you thought of my case. Should I get ill again I

will just come and see you. I hope I am doing right, walking and doing any other thing I like."

Case LXVIII.—Married, age 40; came from London to Edinburgh in January, 1888.

For some years past, when this lady was in Scotland, she has consulted Dr. Keith on account of a fibroid tumor of the uterus, giving rise to symptoms which prevent her enjoying life as she might and ought to do. At the same time those symptoms have never been of sufficient severity to make an operation justifiable. There is difficulty in walking, with pain in the left side and left leg. She can manage a mile or so with tolerable ease. At the commencement of the treatment the lady suggested that she would consider herself cured if she were enabled by its means to walk twelve miles and get up into a high dog-cart.

The tumor in January extended to a little above the level of the umbilicus on the right side, and scarcely so high up on the left. The cervix was awkwardly situated; it was so far back as to be almost out of reach.

The treatment consisted in twenty-four applications; during the first four the sound was made positive, in the remainder it was negative. Owing to the position of the tumor the applications were always painful, though there was great improvement in this respect after the mass became smaller and more movable, and when the cervix had come into its natural position.

January 14th, 1888, 100 ma. 16th, 90 ma. 18th, 150 ma. 20th, 150 ma. 23d, 100 ma. 25th, 140 ma. 27th, 150 ma. for 5 minutes each.

February 1st, 100 ma. 8th, 120 ma. for 5 minutes each. There has been rather less flow during the period which is over. There is now much less pain in the leg, and the patient can walk better. This improvement she notices most when going up and down stairs. 10th, 125 ma. for 5 minutes. The cervix is now in its normal position, and the application caused much less pain. 20th, 110 ma. 22d, 110 ma. 24th, 115 ma. 27th, 130 ma. 29th, 150 ma. for 5 minutes each.

March 10th, 150 ma. 12th, 170 ma. 14th, 150 ma. 16th, 170 ma. 17th, 175 ma. 19th, 180 ma. 21st, 170 ma. 23d, 170 ma. for 5 minutes each. Says that she feels so much better.

April 28th.—Has been able to walk four miles, and can now get up on to a drag.

April, 1889.—Is now very well.

July 2d.—The lady called to-day; she was looking very well, said that she could do anything, and could not express how much better she feels.

Case LXIX.—Married, age 46; came up one forenoon to the infirmary, in December, 1888.

Twelve years ago she had a small fibroid tumor of the uterus. Year by year the tumor has increased in size, until it is a thing of probably between 50 and 60 pounds in weight. For a few years there was menorrhagia; but this symptom ceased years ago without treatment. There is sometimes a little difficulty in passing water. In all other respects there is not any trouble, except from the weight of the large mass. The only sister of the patient, who is now 53 years of age, has a small fibroid tumor, which is still bleeding. I was told that a couple of years ago an attempt was made to give relief by operation, and that after two hours' work nothing was accomplished—neither removal of even a piece of ovary, tube nor tumor!

The abdomen was enormously distended by a soft, fluctuating tumor, the skin being tightly stretched over it. There was not any tumor to be felt in the pelvis, and the cervix, which was quite small, could be reached with difficulty. The sound passed a long way into the centre of the mass.

We were very anxious to try the effect of the electrical current on a fibro-cystic tumor, and although this would have been a very favorable case for operation, in spite of the size, we determined to try what could be done for her relief by the battery, and the patient was warned that there might not be any result. The treatment was carried out at the Woman's Dispensary, Edinburgh.

January 16th, 1888, 75 ma. 20th, 110 ma. for 5 minutes each. 23d, 210 ma. for 4 minutes.

February 13th, 100 ma. 17th, 150 ma. for 5 minutes each. The negative electrode was internal. The tumor is smaller, softer, and the skin is not so tense. The patient is able to button four buttons of her dress, which would not meet before. 22d, 100 ma. 24th, 200 ma. 27th, 250 ma. 29th, 350 ma. for 5 minutes each.

March 2d, 350 ma. 5th, 350 ma. 9th, 150 ma. 14th, 300 ma. 16th, 300 ma. 19th, 350 ma. for 5 minutes each. 21st,

290 ma. for 8 minutes. 23d, 290 ma. 26th, 250 ma. 28th, 290 ma. 30th, 300 ma. 31st, 275 ma. for 10 minutes each.

April 2d, 300 ma. 4th, 220 ma. for 10 minutes each.

It will be noted that the strength of the current used in this case exceeded that of any other. Indeed, with the same battery and with the same apparatus it was possible to pass through this patient a current 25 per cent stronger than could be got through any other patient. This is to be accounted for by the thinned and tense condition of the skin and the cystic nature of the tumor, it being practically a salt solution, and offering little resistance to the passage of the electrical current.

The result of the treatment, which had, however, to be discontinued sooner than it would otherwise have been by our departure for London, was not very satisfactory. The patient felt a little lighter, and the dress, four buttons of which would not fasten, was now quite loose. The ensiform cartilage also did not stick up so prominently as it had done. The tumor did not bulge so much at the sides, and the skin was looser.

In September there was little change, except that the tumor was very much to one side.

In January, 1889, the mass, judging by the general appearance of the dress of the patient, was the same size as it had been nine months before; so that at the end of a year there had been some diminution instead of decided increase as usual. The general health was good, and the woman seemed to walk more lightly. Whether prolonged treatment would have reduced the size in any marked degree it is, of course, impossible to say; but had it been possible, I should much like to have tried.

Case LXX.—Married, age 44; four children, the youngest four years of age.

Before the birth of her last child menstruation had always been regular, lasting usually six or seven days. For the four years since the child was born there have been great and increasing quantities of blood lost. She considers that the loss has been slight if it continues for ten days, and sometimes it goes on for three, and on one occasion for six weeks. The cavity of the womb was curetted by the late Dr. Angus Macdonald without benefit. There has been in addition a profuse watery discharge since June, 1887. There is constant

backache and very frequent headache, especially after the periods.

On examination in January, 1888, the tumor was found to extend up into the abdomen as far as midway between the pubes and umbilicus, and the depth of the cavity was $4\frac{3}{4}$ inches. Patient is very anæmic, and unable to do almost anything.

The treatment consisted in thirty-two applications, during all of which the sound was attached to the positive pole of the battery.

January 18th, 1888, 100 ma. 20th, 135 ma. 23d, 140 ma. for 5 minutes each. Patient thinks that her back is not quite so painful. 25th, 150 ma. for 10 minutes. 27th, 200 ma. for 8 minutes.

February 21st, 110 ma. for 5 minutes. The period has lasted for three weeks, though for the first ten days there was very little discharge. On the whole, the quantity has not been greater than the average. 23d, 140 ma. 25th, 140 ma. 27th, 125 ma. for 5 minutes each. Is bleeding again; but there is less headache and pain in the back than usual.

March 1st, 2d, and 3d, 130 ma. for 5 minutes. 5th, 150 ma. for 5 minutes. The bleeding has continued since the last note was made. There has not been much loss, however, and the patient is feeling better and stronger in every way, and her friends have remarked on her improved appearance. She can now go up-stairs with comfort instead of with a struggle, accompanied by an attack of breathlessness. 6th, 7th, and 8th, 150 ma. for 5 minutes. Bleeding, which has been going on since the 27th of last month, has now ceased. 9th, 140 ma. 10th, 120 ma. for 5 minutes each. The passage of the sound does not now give rise to pain as it used to do. 12th, 120 ma. 13th, 120 ma. 14th, 125 ma. 15th, 170 ma. 16th, 175 ma. 17th, 150 ma. for 5 minutes each. There has been a little discolored discharge nearly every day. 19th, 160 ma. 20th, 130 ma. 21st, 160 ma. for 5 minutes each. The patient walked farther to-day than she has been able to do for a long time. There is less leucorrhœal discharge. 22d, 150 ma. 24th, 150 ma. 26th, 160 ma. 28th, 160 ma. for 5 minutes each. 30th, 165 ma. for 10 minutes.

It will be noted that twenty-three applications were made during the month of March.

The following are extracts from various letters received:

April 8th, 1888.—"I kept well for a month, and the bleeding came on on Sunday, the 5th April, just a little every day till Thursday, when it got worse, and has done so every day. To-day is the worst day I have had; indeed I am losing quite as much yesterday and to-day as I used to do. I did not go to bed till yesterday. I have a good deal of pain to-day. Should I take any Hazaline? Do you think that it will be necessary for me to have more electric treatment?"

May 29th, 1888.—"The previous time I wrote I had to be in bed only four days, two of which were pretty bad. I kept a month better, and then a brownish-red discharge began, just a little every day for about six days, and now it has quite stopped. I had neither to go to bed nor remain in the house, but walked about as usual. I am feeling a great deal stronger than I did, and am much surprised that I have got over my period this time so easily. Or could it be possible for me to be in the family way? I have no premonition of anything as yet, but with the losing so very little this time I have a dread of it."

October 3d, 1888.—"I am sorry to have to tell you that I have had a bad period this time. I have been very well for the last few months, a month and six weeks being between the periods, although the time they lasted was from ten days to a fortnight. This time I was better for two months, and then the bleeding came on very gradually. I went about for three or four days; then I had to keep on the sofa; and, latterly, had to rest in bed for four days. I thought I was almost better, and got up, when the bleeding returned pretty bad, and has continued; one day a good deal better and another day a good deal worse. I am rather downhearted, as I thought that I was cured."

December 17th, 1888.—"I have had another rather bad period. It was nearly eight weeks between the last; but during the interval, after getting better of the last period (I was a fortnight unwell), I was quite well for a week, when the bleeding came back and lasted a week; but I did not require to rest in bed. The bleeding then returned, a little every week, for three or four hours, mostly every day, for three or four weeks, and about a fortnight before I became unwell this time it had quite disappeared. The bleeding came on more rapidly on the 5th December. I was able to be out of bed till

the 10th, the bleeding then being worse than I have had it since I had your treatment. I got up on the 13th, but had to return to bed, as I had a great deal of pain and the bleeding was pretty bad. I am still in bed, and the bleeding is nearly gone."

January 19th, 1889.—On examination, it was found that the uterus appeared to be of normal size. On the whole the patient said that she is much better and the bleeding is much less, but it often comes on without warning and at irregular times.

Case LXXI.—Married, age 46; was sent to Edinburgh by Dr. Mackie, Brechin, in January, 1888.

It is ten years ago since the tumor was first noticed, and it has gradually given rise to more and more discomfort and feeling of fulness and weight in the pelvis. The "periods" are profuse, and have been accompanied for a long time by sickness, and, in addition, she is seldom free from such attacks for a week at a time. On examination, the cervix was felt to be large, the cavity of the uterus measured five inches, the sound passing behind the mass of tumor, which reaches up to the level of the umbilicus.

The treatment consisted in twenty-three applications, the current being allowed to flow from the abdomen to the sound in the cavity. At no time was the passage of the current well borne; at first it was decidedly painful, and even toward the end of the treatment it was not possible to employ a strong current.

January 21st, 1888, 50 ma. 23d, 50 ma. 25th, 45 ma. for 5 minutes each.

February 7th, 40 ma. for 5 minutes. There has been rather more discharge than usual, but unaccompanied by an attack of sickness. The application to-day was more easily borne. 9th, 70 ma. 11th, 70 ma. 14th, 100 ma. 16th, 50 ma. 18th, 100 ma. 21st, 55 ma. for 5 minutes each. The tumor is smaller, and the patient says that she feels more comfortable. 23d, 75 ma. for 5 minutes.

March 3d, 80 ma. 6th, 90 ma. 8th, 85 ma. 10th, 70 ma. 13th, 85 ma. 15th, 75 ma. 17th, 80 ma. for 5 minutes each. Feels better and lighter, and has not had an attack of sickness since the treatment was begun. 20th, 27th, 29th, and 31st, 80 ma. for 5 minutes.

April 2d, 80 ma. for 5 minutes. The patient said to-day that at the commencement of the treatment she would have been much pleased to leave Edinburgh, but that now she sees what a pity that would have been. The tumor can be scarcely felt above the pubes.

June 8th.—"Dr. Mackie thought the tumor much reduced a month ago, and I am better in the way of not being so often sick or having quite so many internal bothers. The thing that disappointed me was, and is, that I am not a bit stronger generally, nor able to do more or walk farther. The headaches, too, are just as bad."

June 28th, 1889.—"When I wrote last summer, three months after seeing you in Edinburgh, I was feeling always weak and tired, but since that I have got much better. When tired I still have twinges in the old spot, and long railway journeys rather knock me up, but I had a very good winter (never had to send for Dr. Mackie from autumn to spring), and am certainly quite different from what I was when you saw me last."

Case LXXII.—Single, age 42.

For 12 years there has been profuse menorrhagia; but the patient says that she picks up very quickly between the periods. She says that she thinks that she does not exaggerate, when she states, that three pints of blood are often lost. On the second night of the flow, the bed has to be made up with towels and extra sheets, to prevent its being soaked with blood. The period lasts six days, and now there is not any pain.

On examination the fundus uteri is found to be lying far back in the hollow of the sacrum. There is no cervix, and the os looks forward. The cavity measures five inches.

January 28th, 1888, 50 ma. for 5 minutes. On moving the sound in the cavity, there was a feeling as if a soft polypus were present. Chloroform was given on the 31st, and a clump of very small mucous polypi were scraped from the fundus.

February 13th, 70 ma. for 5 minutes. The period has been scarcely so bad as usual. 15th, 85 ma. for 7 minutes. 17th and 20th, 100 ma. for 5 minutes. The uterus has now left its position of retroversion, and the sound passes forward. The upper part of the tumor, which was at first to be felt lying in the hollow of the sacrum, is almost touching the anterior

abdominal wall. 24th, 100 ma. 28th, 110 ma. for 5 minutes each.

March 8th, 120 ma. for 5 minutes. The period has been as bad as ever. 10th, 130 ma. 12th, 90 ma. 13th, 150 ma. 14th, 110 ma. 15th, 110 ma. 17th, 140 ma. 19th, 160 ma. 21st, 170 ma. 23d, 210 ma. for 5 minutes each.

It was arranged that the treatment was to be continued in London, but, owing to the death of a sister, it has not been gone on with. There has not been improvement.

Case LXXIII.—Single, age 40.

This lady had a large soft fibroid extending well under the ribs on either side. The tumor was first noticed six years before, when it was already of some size. She had neither pain nor hemorrhage, and treatment was undertaken simply with the view of reducing the size of the tumor. The uterine cavity was $3\frac{1}{2}$ inches.

February 18th, 1888, 55 ma. 21st, 100 ma. 23d, 130 ma. 25th, 125 ma. 27th, 180 ma. 29th, 185 ma. for 5 minutes each.

March 2d, 200 ma. for 5 minutes. The tumor is free of the ribs. On the left side a mass has come from underneath the ribs, which has much the appearance of a large spleen. It turned out to be an outgrowth from the tumor. 5th, 230 ma. 7th, 225 ma. 13th, 190 ma. for 5 minutes each. There has been more flow than usual. 15th, 210 ma. 17th, 210 ma. 19th, 200 ma. 21st, 210 ma. 23d, 250 ma. 26th, 260 ma. 28th, 250 ma. 30th, 110 ma. for 5 minutes each.

The tumor can now almost be pushed to the left side of the middle line. This caused a little pain, and it was proposed that the application should not be made, more especially as the lady said that she had felt some pain for a day or two in the left side. She made light of this, however, and as the application was to be the last in Edinburgh, it was given. It was made only half the usual strength. She had in all eighteen negative applications, and she intended to come south and continue the treatment if necessary. Sixteen days after coming to London I had a letter from a medical friend in Edinburgh, who had been asked to see her. She had gone about a good deal; the weather was bitterly cold, and she had got a chill. She had severe pain over the region of the spleen, with fever. This continued for four days, and was followed by vomiting and diarrhœa. She then began to improve, was

sitting up in bed and talking of going south as soon as she was able. The night before I heard of her, she was seized with two floodings during the night, so severe that she was for some time pulseless after the second attack. The hemorrhage then ceased, but there was a sudden return of it next day, and she died during it. One cannot help thinking that plugging the cervix or vagina, which in her case was short and small, might have saved her.

Case LXXIV.—Married, age 27; came to the Woman's Dispensary, Edinburgh, on February 1st, 1888.

Patient had been married for two years, and had not been pregnant. A year ago she began to have some difficulty in passing water at times, and four months afterward the water had to be drawn off with a catheter just as the menstrual flow was commencing. Since that time the catheter has been required to be used on several occasions. Menstruation has been for some years profuse, and the usual time the flow is on is twelve days. In the Royal Infirmary, where the woman was a patient for some weeks, Barnes' bags were used, and she was told that they did her good; she, however, did not feel any benefit.

The patient was a small, delicate-looking woman, and on examination it was found that the uterus, enlarged to the extent of almost filling the pelvis, was retroverted; the cervix had been completely drawn up into the mass, and the os could be reached with difficulty immediately behind the upper margin of the pubes. On account of its relation to the bone it was not possible to bend a sound so as to allow of its entrance into the interior of the womb. It was therefore necessary to puncture in the centre of the mass.

February 1st, 40 ma. 3d, 25 ma. for 5 minutes each The puncture was repeated a second time. On both occasions the patient complained of great pain. On the 27th of the month she came back. She had passed through a menstrual period more easily than usual. It had lasted six instead of twelve days; there had been less discharge, and there had not been any stoppage of the water. A marked difference in the local condition was felt; there had been partial rotation of the uterus; there were some appearances of a cervix, and the os, which was now midway between its old position behind the pubes and the ordinary one, could be easily entered by the

sound, which passed to a depth of 4¼ inches. 27th, 75 ma. 29th, 50 ma. for 5 minutes each.

March 5th, 70 ma. 9th, 40 ma. 19th, 100 ma. for 5 minutes each.

It was not necessary to puncture on any of these occasions. The patient did not feel any better, and had had to take off the water once.

Seven applications, five negative with sound in the cavity, two negative punctures, the average strength being 57 ma. This patient was entirely lost sight of.

Case LXXV.—Age 49.

In the end of 1885, or beginning of 1886, a submucous fibroid the size of the fist was removed. This tumor had caused excessive hemorrhage, and the periods became normal after its removal. Pain was, however, said to be more or less constant, and in the beginning of 1888 fourteen applications of electricity were made, the sound being negative.

February 7th, 45 ma. for 5 minutes.

March 3d, 55 ma. 6th, 65 ma. 8th, 100 ma. 10th, 100 ma. 12th, 80 ma. 15th, 125 ma. 17th, 120 ma. 20th, 100 ma. 22d, 130 ma. 24th, 120 ma. 27th, 125 ma. 29th, 135 ma. 31st, 85 ma. for 5 minutes each.

The average strength was almost 100 ma.

The result was some diminution in the amount of discomfort.

Case LXXVI.—Age 35; came to the Woman's Dispensary on the 10th of February, 1888.

A tumor had been noticed in the abdomen eleven years ago. Increase of menstruation for last eight years. The periods, which formerly lasted three or four days, are now prolonged to fourteen and sixteen. Has been in the infirmary under the care of Professor Simpson and the late Dr. Angus Macdonald, and says that she has consulted a great number of doctors. Injections of ergot have been tried, and have failed to arrest the bleeding.

A large tumor extending up underneath the ribs on both sides was felt. The os was situated far back, and the sound passed 8 inches into the uterine cavity.

A current of 70 ma. was passed from the abdomen to the sound for 5 minutes.

This patient did not come back, and I heard nothing more of her. The visit was somewhat of a begging nature.

Case LXXVII.—Married, age 48; was sent by Dr. Connel, of Peebles.

Until the age of 35 the general health was very good, and the periods recurred with unfailing regularity every four weeks. Since that time there has been a decided increase, the quantity of blood lost steadily increasing, until now it is about four times as much as it used to be, and instead of recurring every four weeks, the flow usually puts in its appearance every two, and never at a longer interval than three weeks. Headaches are often very severe, and the lady is frequently confined to bed, and says that she feels a loss of brain power. A visit to Schwalbach did good for some time, but toward the end of 1887 she completely broke down.

The tumor is not prominent, and extends to within 2 inches of the umbilicus. The cavity measures $4\frac{3}{4}$ inches.

February 23d, 1888, 100 ma. 25th, 115 ma. 27th, 140 ma. 29th, 160 ma. for 5 minutes each.

March 1st, 165 ma. 2d, 180 ma. 12th, 110 ma. for 5 minutes each. The period is over; the quantity has been the same as usual, but the patient feels better. 13th, 160 ma. 14th, 180 ma. 15th, 180 ma. 16th, 175 ma. 17th, 185 ma. 19th, 180 ma. 20th, 190 ma. for 5 minutes each. Usually at this time the lady feels ill, but as yet she is very comfortable. 21st, 210 ma. 23d, 160 ma. 24th, 175 ma. 26th, 150 ma. 27th, 160 ma. for 5 minutes each. The treatment was discontinued, and is to be begun again in London in a month or so. Before it was restarted we had come to the conclusion that it was a mistake to make the applications as quickly as had been done in this case, viz., twelve in fifteen days.

April 21st, 100 ma. 23d, 115 ma. 25th, 150 ma. 27th, 100 ma. 30th, 100 ma. for 5 minutes each.

May 2d, 85 ma. 4th, 125 ma. 14th, 115 ma. for 5 minutes each. The patient is sleeping much better and looks better. 16th, 115 ma. 18th, 100 ma. 23d, 115 ma. 25th, 125 ma. 28th, 125 ma. 30th, 125 ma. for 5 minutes each.

June 11th, 110 ma. for 5 minutes. The sound was always attached to the positive pole of the battery. The average strength was 140 ma.

The period has been, on the whole, better, and the lady's son thinks that she is much improved.

The after-history has not been satisfactory. The only dif-

ference that we can think of to account for this is that some of the applications were made with little or no interval between them.

Case LXXVIII.—Married, age 51; was sent through from Glasgow by Dr. Moore, and attended the Woman's Dispensary, Edinburgh.

Menstruation began at the age of fourteen, and was accompanied by somewhat severe pain until marriage, at the age of 37. Four children were born, and the general health was good until three years ago. About this time the flow every month began to be prolonged, and soon, instead of returning every month, it sometimes made its appearance every fortnight, lasting for ten instead of six days. Dysmenorrhœa which had been absent for eleven years returned. A year after these symptoms appeared, a swelling was felt in the abdomen. This swelling is slowly increasing in size, and has given rise to constant pain and to a great deal of suffering

On examination, the swelling is found to extend to six inches above the pubes and to distend the abdomen a little. In the pelvis it is found to press on the bladder and to fill the whole pelvic cavity. The sound passes $4\frac{1}{2}$ inches.

In the treatment of this case negative applications were made.

February 29th, 1888, 65 ma. for 5 minutes.

March 2d, 100 ma. 5th, 140 ma. 7th, 125 ma. for 5 minutes each. Both above and in the pelvis there is a marked difference, even from day to day. 9th, 135 ma. 14th, 140 ma. for 5 minutes each. Patient remarked that she had so much less pain. 16th and 26th, 125 ma. for 5 minutes. The period lasted one day longer than usual, but there was much less blood lost, and less pain. The tumor is smaller in the pelvis, and extends to three instead of to six inches above the pubes. 28th, 160 ma. 30th, 135 ma. 31st, 145 ma. for 5 minutes each. There is still some pain at one spot in the left side.

April 2d, 135 ma. 3d, 160 ma. 5th, 210 ma. 6th, 200 ma. for 5 minutes each. In all, fifteen applications, with an average strength of 140 ma.

The pain in the left side has gradually become less, and is now quite absent. The patient is in much better health and spirits; she has lost her look of depression, and the tumor is about one-third the size it was five weeks ago. The way in

which this tumor decreased from day to day was very remarkable.

Dr. Moore wrote on the 20th June, 1889, "I have just had an interview with Mrs. ——, and I am glad to say she has had no return of hemorrhage since you operated. I had no opportunity of examining the remains of the fibroid; but she says that she thinks it is all gone. You remember the poor woman was fast sinking from hemorrhage, when you kindly took her in charge. In her own words, she was 'never dry.'"

Case LXXIX.—Married, age 37; came into Edinburgh in the beginning of March, 1888.

An abdominal swelling was first noticed about five years ago, and although there have been occasional attacks of pain in it, there was really little trouble until a few months ago. The patient has found that of late her general health has been failing, and that the quantity of loss at the periods has been increased, and there has been great pain. The most annoying symptom is, however, a difficulty in passing water; and on one occasion there was complete stoppage, and relief had to be given by emptying the bladder with a catheter.

On examination, a very prominent tumor, reaching up to the level of the umbilicus, is found. There is not any cervix, and the opening into the uterus is situated high up on the left side, and almost out of reach of the finger.

The treatment consisted, unfortunately, in only ten negative applications.

March 7th, 1888, 75 ma. 9th, 125 ma. for 5 minutes each. The patient felt very tired yesterday after the first application. There is a marked diminution in the size of the tumor after only one sitting. 12th, 125 ma. 14th, 115 ma. for 5 minutes each. Already the patient says that her dress feels much looser, that she can walk better, and has now not any discomfort with the bladder. The tumor is immensely smaller, and the os uteri is an inch lower down. 16th, 100 ma. 19th, 150 ma. for 5 minutes each. Every day the tumor is found to be smaller. 28th, 150 ma. for 5 minutes. The period has been quite easy, and the patient is much surprised that there was not any trouble or discomfort of any kind. 30th, 150 ma. 31st, 160 ma. for 5 minutes each.

April 2d, 130 ma. for 5 minutes. The tumor is to-day about one-third the size it was less than four weeks ago. The aver-

age strength of the ten applications was rather more than 120 ma.

Case LXXX.—Age 34. In this patient there had been great difficulty in her last two confinements on account of a tumor filling up the cavity of the sacrum. She was seen several times at intervals of a few months before the treatment was commenced. There was steady increase in the size of the tumor, which extended half-way up to the umbilicus when the first application was made. The mass comes off from the back of the uterus, which is easily felt above the pubes, being entirely drawn into the abdomen. The posterior lip of the cervix is quite lost in the tumor. The left ovary is easily felt; it is always tender and irritable.

The treatment consisted in thirty applications. Negative puncture was almost always used. As the tumor diminished the sound could be passed into the cavity of the uterus, and some of the applications were made that way, toward the end of the treatment. In this case there was more pain experienced by the negative puncture than we had ever met with, and some of the punctures were followed by profuse watery discharge, which continued for several days. In spite of the pain, the patient asked for the puncture, as she always felt so much more relieved by it.

March 12th, 1887, 55 ma. 14th, 100 ma. 16th, 80 ma. 19th, 90 ma. 21st, 100 ma. 23d, 135 ma. for 5 minutes each. The tumor is smaller.

April 12th, 110 ma. for 5 minutes. Has had an easy period. 14th, 65 ma. 17th, 60 ma. 19th, 60 ma. for 5 minutes each. 21st, these last punctures have been somewhat painful. The left ovary is much more free, and the body of the uterus more distinct from the mass behind—altogether smaller. A great deal of watery discharge. As there is still some pain, no application was made to-day. 23d, 60 ma. for 5 minutes.

May 2d, 60 ma. for 5 minutes. 7th, 50 ma. for 10 minutes. 9th, 155 ma. for 5 minutes. To-day sound passed into cavity of uterus. There has been profuse watery discharge, which has given great relief. 11th, 55 ma. 14th, 140 ma. 16th, 70 ma. 26th, 70 ma. 28th, 30 ma. for 5 minutes each. There is a distinct cervix to-day, and all bladder trouble has ceased. Feels by her dresses how much smaller the tumor is. The last puncture was again painful, and only 30 ma. could be

borne. Great watery discharge followed. The rest of the applications were now made easily in the cavity of the uterus.

June 2d, 110 ma. 4th, 120 ma. 6th, 150 ma. 8th, 170 ma. 11th, 130 ma. 13th, 160 ma. 21st, 130 ma. 23d, 140 ma. 25th, 135 ma. 27th, 135 ma. for 10 minutes each. The last period was good and painless. There has been marked diminution in the size of the tumor. The patient returns home feeling well. The tumor is now central, and one-fourth the original size. Nothing remains but a thin flattened mass in the roof of the pelvis. Now it is impossible to tell what the tumor is. It might easily be mistaken for a simple cellular swelling.

June 29th, 1889.—This lady writes, "I am really very well, and able for any ordinary amount of fatigue. The periods continue quite normal, so different to what they used to be. In fact, I really am very well."

Case LXXXI.—Married, age 40; came home from India for the electrical treatment in the beginning of 1888.

This lady had never been at all robust, but she had been able to enjoy life until a few years ago. A fibroid tumor of the uterus had been responsible for her bad health in late years, and she is very anxious to be relieved of her pain and discomfort, and to get strong again.

The chief symptom is pain, situated principally in the lower part of the back. There is also a general feeling of discomfort and fulness, much worse during the periods, which are greatly in excess, and which also appear too often. The lady looked ill; she was thin and wan, and on examining the abdomen a very prominent tumor was seen and felt. The mass extended upward to 1½ inches above the umbilicus. The abdominal wall was thin, and was tightly stretched over the tumor. On passing the finger into the vagina the growth is felt almost at once, and is found to be tightly packed into the pelvis. The cervix is obliterated, and the os is situated as far back as possible, and toward the right side.

March 23d, 1888, 60 ma. for 5 minutes. As was to be expected from the position of the uterine canal, the application was not well borne. 26th, 55 ma. 28th, 60 ma. for 5 minutes each. The sound passed much more easily.

April 25th, 75 ma. for 5 minutes. The treatment which had been begun in Edinburgh was recommenced, after a month's interval, in London. There is now quite a well-marked cervix. 27th, 70 ma. for 5 minutes. The tumor is decidedly smaller.

May 10th, 65 ma. for 5 minutes. The period has been got through much more easily than usual; the long interval of rest from treatment being accounted for by an attack of dysentery. 12th, 65 ma. 15th, 60 ma. 17th, 85 ma. 19th, 45 ma. for 5 minutes each. Until to-day the sound has been connected to the negative pole of the battery; but on account of there being more pain than usual, it was made positive, and gave great relief.

June 8th, 50 ma. for 5 minutes. A return was made to the negative sound. The tumor decreases steadily, and the abdominal wall is taking on fat. The period was much as the last. 11th, 45 ma. 13th, 70 ma. 15th, 50 ma. 30th, 40 ma. for 5 minutes each. A very easy period, with little flow.

July 2d, 65 ma. 4th, 75 ma. for 5 minutes each. Said that she felt very tired yesterday evening, but allowed to have been shopping for four or five hours. 6th, 75 ma. 11th, 80 ma. 26th, 55 ma. 28th, 75 ma. 30th, 85 ma. for 5 minutes each.

August 1st, 85 ma. 3d, 100 ma. 6th, 80 ma. 21st, 105 ma. for 5 minutes each. The period has been again easy. 23d, 75 ma. 25th, 120 ma. 27th, 135 ma. 29th, 135 ma. for 5 minutes each. The sound was made positive during the last four applications. The lady is very well, and the tumor is decidedly less than half the size it was. The average strength of the thirty applications has been 75 ma.

May, 1889.—The general health has been very good, and the lady has been able to do anything she wanted to for the last nine months. She has entirely lost her old haggard look, and has now a clear, fresh complexion. The tumor is rather smaller than it was in August of last year, and the wall is quite fat, and is quite loose.

Case LXXXII.—Single, age 36; was sent by Dr. Priestley.

The history of this patient was, that for a number of years she had not known what it was to feel well, even for a day. She was always more or less ill, but this she would have been able to put up with, had it not been that, during the time of the menstrual flow, she suffered terribly from pain, from headache, from sickness, and from menorrhagia. For those attacks of pain and sickness, which recurred at intervals of three weeks, morphia had been taken in increasing doses for some years.

Treatment of all kinds had been tried without relief. It

had been suggested that she should have an operation, but this, both she and her friends would not consent to.

On examination, a fibroid tumor of the uterus was found to entirely fill the pelvis. The exact condition was made out with some little difficulty, on account of excessive tenderness in every direction. The passage of the sound was not easy from the same cause. Treatment by electricity was agreed to, and the lady came to town twice a week for the applications. She had a railway journey of one and half a hours each way.

April 9th and 11th, 50 ma. for 5 minutes. The passage of the sound causes so much pain that the applications were badly borne. She was very tired after the first one. 13th, 70 ma. for 5 minutes. 16th, 18th, and 20th, 65 ma. for 5 minutes.

May 1st, 50 ma. for 5 minutes. The period has been quite as distressing as usual, and the usual doses of morphia were taken. 5th, 60 ma. 8th, 80 ma. 12th, 60 ma. 15th, 90 ma. 29th, 40 ma. for 5 minutes each. There has been more flow, but accompanied by less pain and headache, and no morphia has been taken for three weeks. This is said to be the longest time she has gone without the drug for some years.

June 2d, 50 ma. 4th, 65 ma. 7th, 75 ma. for 5 minutes each. Says that she is feeling decidedly better, and, in fact, almost quite comfortable. The tumor is much smaller. 13th, 75 ma. 16th, 70 ma. 30th, 60 ma. for 5 minutes each. There has been a wonderfully easy period, and now the patient feels well. She thinks that her progress is wonderful.

July 3d, 75 ma. 7th, 80 ma. 10th, 75 ma. 14th, 70 ma. 17th, 70 ma. 28th, 50 ma. for 5 minutes each. There was much less pain, and no morphia was required.

August 4th and 11th, 50 ma. for 5 minutes. There is now scarcely any trace of tumor; and although the strength of the current has never been great, the treatment will be discontinued in the mean time.

May, 1889.—On examination, the pelvic contents appear to be normal. There is still some pain and occasional headache, but the improvement is very great, and morphia is not required.

Case LXXXIII.—Married, age 48; came to Edinburgh in the beginning of March, 1888.

The history of this lady's illness dates back to the year

1874; at least this was when she first consulted a doctor about an increasing monthly loss. In 1876 she was under the care of Dr. Murray, of Newcastle, and in 1877 she went to Edinburgh to see Dr. Keith. Owing, however, to his being away from home, the patient saw Dr. Matthews Duncan. At that time the symptoms appear to have been hemorrhage, leucorrhœa, and pain. She was sent to Germany for some time, and when she again arrived in Edinburgh it was found that a submucous tumor was presenting. It was sloughing, and was removed, and the lady survived a severe attack of blood-poisoning. Dr. Duncan told her that it was not at all unlikely that she would have another of these tumors. She kept well for two years, and then all the old symptoms returned, and gradually got very bad, and the lady became too ill to travel. In 1882 Mr. Teale, of Leeds, removed another tumor after dilatation of the os, and as she had not improved, she was curetted once in 1883. Since that time she has been steadily going down hill, and nothing had done her good except visits to Woodhall Spa.

Now she suffers from excessive losses of blood every month, and is always in bed for four or five days, and there is, and has been for many years, a constant white discharge from the uterus.

The general condition is very bad, and the lady is very anæmic. For years the patient has been unable to sit or to lie on the right side.

On examination in March, 1888, it was found that there was a fibroid tumor of the uterus, extending up to the level of the umbilicus, and that the os uteri was somewhat open. As it was evident that the presence of a submucous tumor was more than likely, the os was dilated, and while there was some roughness of the lining surface to be felt, nothing of the nature of a tumor was found.

April 9th, 1888, 115 ma. for 5 minutes. 11th, 90 ma. 13th, 120 ma. for 7 minutes each. 14th, 120 ma. for 5 minutes. The lady was able to walk to Clarges Street after the application. 16th, 130 ma. 26th, 125 ma. for 5 minutes each. There has been decidedly less bloody discharge than usual. 28th, 115 ma. 30th, 120 ma. for 5 minutes each.

May 7th, 140 ma. for 7 minutes. There has been another attack of bleeding and the applications are to be made in

future while the lady is in her own bed. 9th, 150 ma. 11th, 150 ma. 22d, 110 ma. for 5 minutes each. There has been a smaller loss than usual. 24th, 170 ma. 26th, 200 ma. 28th, 175 ma. 30th, 110 ma. for 5 minutes each. There is some decided improvement in the general appearance, and the patient says that she feels better.

June 1st, 175 ma. 2d, 175 ma. 4th, 200 ma. 6th, 175 ma. 8th, 175 ma. for 5 minutes each. The period is on; but the applications are to be continued through it. 11th, 175 ma. 13th, 160 ma. for 5 minutes each. Patient says that she feels better than she did after the last period was over. There was rather more discharge. 15th, 150 ma. 16th, 160 ma. for 5 minutes each. 18th, 150 ma. 20th, 150 ma. 22d, 150 ma. 23d, 140 ma. for 8 minutes each. The tumor is smaller, and the patient looks better, and says that she feels better in every way.

After going home there was at first little if any improvement, but on the 23d November we had better news: "I really have had a better time, I am very thankful to say, and if only a few of these would come, I should be making way."

December 19th.—"It really seems as if the improvement had begun. The last time was the best I have had yet; much less pain; and though I began nearly a week before time, I was not so restless and uneasy either at the time or on the mend. I still have a great deal of whites, especially the last few days, when I have been out in the Bath chair. I begin to think, at this time of year, the shaking I get counteracts the good from the fresh air. I do feel very thankful for this improvement, and pray it may continue."

The next period was a bad one, and the patient came back to town in the beginning of February, and on asking if she felt better than she did before the treatment, she replied that she would not have come back had she not felt better. The tumor was found to be 2 inches below the umbilicus, and projecting through the os, which was dilated to the size of a shilling, was an intra-uterine fibroid.

The cervix was dilated, and on the 16th February the tumor was removed piecemeal. It was attached to the fundus on the right side, corresponding to the spot where there was constant pain. Within a few days the white discharge, which had not been absent for years, entirely ceased, and before going home the lady could sit up to her meals.

July.—The patient is steadily improving.

Case LXXXIV.—Married, age 29; was seen with Dr. Matthews Duncan.

The patient is a fragile, delicate woman, and has been much pulled down in the last few years by too frequent and too profuse losses of blood at the periods. It is not necessary to say that all treatment short of operation has been tried.

On examination, it was found that the pelvis was filled by a tumor, which reached up into the abdomen. The cervix was small and lying on the pelvic floor. Examination was difficult on account of great tenderness.

It was determined to begin with a weak strength of current, and to make the applications at the lady's own house; and on every occasion the sound was made positive.

April 14th, 1888, 30 ma. 16th, 30 ma. 18th, 45 ma. 20th, 40 ma. for 5 minutes each. 23d, 35 ma. for 8 minutes. 25th, 35 ma. 27th, 30 ma. for 10 minutes each.

May 7th, 40 ma. for 10 minutes. The period has been much as usual. 9th, 100 ma. 11th, 70 ma. 14th, 90 ma. 16th, 90 ma. for 5 minutes each. There is not much appreciable difference, except that the lady feels better than usual on the day after each application. 19th, 80 ma. 21st, 110 ma. for 5 minutes each.

June 1st, 65 ma. for 5 minutes. The period only lasted five days. 4th, 80 ma. 6th, 75 ma. 8th, 90 ma. 19th, 50 ma. for 5 minutes each. There has been rather a profuse discharge, but in spite of it the lady feels better. 21st, 55 ma. 22d, 95 ma. 25th, 90 ma. 27th, 100 ma. for 5 minutes each.

July 6th, 80 ma. 9th, 80 ma. 11th, 90 ma. 18th, 90 ma. for 5 minutes each. The smallest period she has had for a very long time, and the lady is in great spirits and feels well. 20th, 70 ma. 30th, 65 ma. for 5 minutes each.

August 1st, 3d, and 6th, 50 ma. for 5 minutes. The average strength of the thirty-two applications was between 65 and 70 ma.

Feels very well. Locally there had not been very much change, though there has been some diminution in the size of the tumor. The lady was good enough to keep a record of the periods after the treatment for nearly a year.

Period commenced on August 5th and did not stop till the 19th. After an interval of twelve days, the flow returned and

continued for five or six days. Interval of four weeks followed by flow for six days, and again a flow of four days after eight days' interval. Then there was nothing for five weeks but one day, and the period was much better and only lasted five days. Clear from 3d December to 6th January, 1889; then for five weeks and a day. Since February the flow appears regularly at intervals of three weeks and four days, and is not more than it used to be before the beginning of the illness.

Extract from letter dated 7th June, 1889: "Will it be convenient if I come to see you some time to-morrow morning, and if so, what hour would suit you best? I want you to see how much better I am, thanks to your wonderful treatment."

Case LXXXV.—Married, age 45; was seen in April, 1888, in consultation with Dr. Butt.

A number of years ago it was first noticed that the quantity of blood lost every month began to increase, and in the summer of 1882 the lady was sent to Kreutznach. This visit was repeated in the two succeeding years. In 1886 to 1887 visits were paid to Woodhall Spa. However, neither Kreutznach nor Woodhall succeeded in diminishing the loss, although they may have prevented its becoming worse. The hemorrhage is so excessive that the patient is frequently confined to bed for two weeks at a time, and she often is so weak and drained that she feels as if she would die. Large clots are passed, and pailfuls (*sic*) of blood. There is pain in the tumor on movement, and she can walk a very little distance at a time.

The patient is very anæmic and breathless, and the tumor, which is not particularly prominent, extends up to the umbilicus. The uterine cavity is large from side to side, and measures 7 inches in depth.

The lady was very anxious to try the electrical treatment, more especially as a friend was at the time under Dr. Apostoli in Paris, and had much improved. The course of treatment extended from the 30th April until the 6th August, and consisted in thirty-two applications, the internal electrode being on every occasion attached to the positive pole of the battery.

April 30th, 1888, 70 ma. for 5 minutes.

May 9th, 110 ma. for 5 minutes. The first application was made in Charles Street, and as it was followed by profuse bleeding for ten days, all subsequent applications were made

at the lady's own house. 11th, 110 ma. 14th, 110 ma. 16th, 115 ma. for 5 minutes each. Is beginning to feel stronger. 18th, 110 ma. 21st, 145 ma. for 5 minutes each. There is a little bleeding to-day. 23d, 150 ma. for 5 minutes. When the patient gets up there is a little red discharge from the uterus. 25th, 160 ma. 28th, 140 ma. for 5 minutes each. The bleeding has now entirely ceased, and the tumor is smaller. 30th, 180 ma. for 5 minutes. Is feeling much stronger, and has been out in a Bath chair.

June 2d, 150 ma. 4th, 190 ma. 6th, 160 ma. 8th, 195 ma. for 5 minutes each. Still feels stronger. There has been a slight red discharge both yesterday and to-day. 11th and 18th, 150 ma. for 5 minutes. The first proper period for six weeks is over. The flow continued for six days, and was by no means excessive. Feels well. 20th, 150 ma. 22d, 180 ma. 25th, 180 ma. 27th, 160 ma. for 5 minutes each. The patient feels very well, in spite of the fact that one of her relations who lives with her is seriously ill. 29th, 150 ma. for 5 minutes.

July 2d, 150 ma. for 5 minutes. Was at the Danish Exhibition for seven hours on Saturday, and at church the day after, without being over-fatigued. 18th, 100 ma. for 5 minutes. Patient went to the country for the period. She caught cold, and there was a great deal of pain in the womb. The amount of blood lost was not nearly so great as before. 20th, 110 ma. 23d, 170 ma. 25th, 125 ma. 27th, 125 ma. 30th, 120 ma. for 5 minutes. The patient walked farther yesterday than she has done for a very long time.

August 1st, 150 ma. for 5 minutes. Yesterday was in the Academy for an hour and a half, standing the whole of the time, and got home without feeling tired, and without any of the old pain in the womb, which used to be so bad when she stood. 3d, 150 ma. 5th, 140 ma. for 5 minutes each. Though there does not appear to be much difference in the size of the tumor, the depth of the cavity is now 5 instead of 7 inches. The patient says that she is better than she has been for a number of years.

March, 1888.—Unfortunately it was necessary for this lady to live in Brighton, although we warned her before she went that there would be almost certainly an increase in the amount of hemorrhage. The result which had been anticipated happened, and the lady came back not nearly so well as she had

been. The last period was, however, much better, and confined her to bed for but two days.

May 28th.—"I have been waiting to tell you how I got over my next bad time, and I have not had one at all! and am feeling so wonderfully well that I do not believe that you would know me."

CASE LXXXVI.—Single, age 32; was sent by Dr. Matthews Duncan, in May, 1888.

Six years ago a tumor was first noticed in the abdomen, and the patient has been under medical treatment since that time. She has paid two visits to Kreutznach and one to Woodhall Spa, and thinks that the "cures" at those places perhaps did her a little good.

She complains of debility with its accompanying distresses. This is due, in great measure, to a constant watery discharge, so profuse as to make the constant wearing of a napkin necessary. There is also a greatly increased loss at the monthly periods, and she is in bed at that time for four days. There are also occasional attacks of pain in the tumor, which, as a rule, swells greatly before menstruation.

Three or four years ago an operation was performed for the cure of the disease. The nature of the operation neither the patient nor her mother can tell. After it, the patient was very ill, apparently from septic absorption.

The patient is very bloodless, and looks weak and ill. She says that for some years the legs have been swollen, and that the swelling is not away when she gets up in the morning.

On examination of the abdomen, there is seen to be quite a considerable amount of œdema beneath the skin. The tumor is very soft, and extends to within one finger's breadth of the ribs. The cervix is far back in the pelvis, and the cavity of the uterus measures eight inches.

The treatment was begun in May, but after seven applications, the patient became very home-sick and returned to Ireland. In August she came back, and thirty-nine additional applications were made. The sound was always attached to the positive pole.

May 3d, 100 ma. 5th, 150 ma. for 5 minutes each. There was some pain in the afternoon of the 3d. 7th, 175 ma. for 5 minutes. The patient says that she feels better, and that there is less of the discharge. 9th, 250 ma. . 11th, 240 ma. for

5 minutes each. The leucorrhœal discharge is as bad as ever. 14th, 240 ma. 22d, 130 ma. for 5 minutes each. There has been a better period than usual.

August.—Since going home the patient says that she has been very ill. Now she looks better than when she left town in May, and the tumor is smaller. 11th, 100 ma. 13th, 125 ma. 15th, 115 ma. 17th, 105 ma. 18th, 100 ma. 21st, 120 ma. 23d, 170 ma. 25th, 155 ma. 27th, 175 ma. for 5 minutes each.

September 3d, 180 ma. for 5 minutes. This period has not been a bad one, and the patient says that she feels stronger. 5th, 170 ma. 7th, 150 ma. 8th, 120 ma. 13th, 140 ma. for 5 minutes each. There has been rather more loss during this period, and the interval was shorter. 15th, 140 ma. 17th, 140 ma. 19th, 130 ma. 21st, 145 ma. 28th, 225 ma. for 5 minutes each.

October 1st, 200 ma. 3d, 160 ma. 5th, 150 ma. 8th, 140 ma. 11th, 160 ma. 13th, 150 ma. 15th, 135 ma. 17th, 160 ma. 22d, 145 ma. for 5 minutes each. The interval between the periods has been longer, and there has not been a greater discharge than last time. 24th, 155 ma. 26th, 160 ma. 30th, 165 ma. for 5 minutes each.

November 1st, 160 ma. 3d, 160 ma. 5th, 180 ma. 7th, 130 ma. 10th, 135 ma. 12th, 160 ma. 19th, 160 ma. for 5 minutes each. There has been rather less flow, and the patient's friends say that they notice a great change for the better. 21st, 160 ma. for 5 minutes. The tumor is now barely up to the umbilicus, and the patient is, in every way, better—less discharge, stronger, and the legs do not swell so much. Extract from letter, dated 15th January, 1889, "I suppose you expected to hear from me before this, and I would have written, but there was not much improvement. I am charmed to tell you now she is much better. She is just over her period, and has not been half as bad as the last time; but the watery discharge continues much the same; for all that she feels stronger.

"All our friends here are quite delighted to see such an improvement in her. The tumor has got much smaller, and her feet do not swell as much as they did when we were in London."

Dr. Ford, of Waterford, wrote in June to say that the lady was losing ground, and sent her to London again in July. She looked fairly well, with red lips; and on examination it was

found that the tumor had not increased in size, but was fully as small as it had been in November of last year. There was, however, very marked œdema of the legs and also of the abdominal wall. The urine was found to contain about one-twelfth albumin on boiling and adding nitric acid.

Case LXXXVII.—Single, age 45; was seen with Sir Spencer Wells in the beginning of March, 1888.

The tumor had been a trouble and annoyance for many years, and of late had become of such a size, that the lady could not sit with any comfort, and the general health was becoming broken down. The patient was so anxious to gain some relief that she started off to Edinburgh without sending word, and arrived there the day after we had left for London.

On examination, the tumor was found to entirely fill the abdomen, reaching up to the ribs. It was particularly hard, and there were several pediculated masses on the surface. The cervix was not to be felt from the vagina, the whole of the pelvis being filled by the lower part of the tumor.

May 8th, 1888, 25 ma. 10th, 45 ma. 14th, 100 ma. 16th, 110 ma. for 5 minutes each. There was considerable pain in the evening after the last application. 28th, 90 ma. for 5 minutes. The period has been much as usual. The tumor is more movable. 30th, 125 ma. for 5 minutes.

June 2d, 140 ma. 4th, 150 ma. 6th, 160 ma. for 5 minutes each. After this application there was a feverish attack, due probably to the use of strong negative doses in a delicate subject.

July 23d, 85 ma. for 5 minutes. The lady is to go out of town for the autumn, and expresses herself as feeling much more comfortable. Dr. Harper, who usually attends her, thinks that the tumor is smaller by one-quarter. On each of the ten applications the tumor had to be punctured, and the needle was made negative.

Case LXXXVIII.—Single, age 43.

For four years or so the patient has been aware that she had a tumor. It varies greatly in size, being very much swollen before the periods. Sometimes only, there is a flooding, but there is great discomfort and uneasiness, and the lady cannot walk far—indeed for a long time she has not walked beyond her garden.

The tumor, after the period is over, extends up to the navel.

The cervix is small, and is situated far back. In front and pressing on the bladder is a mass of tumor. The sound passes backward, then to the left, and finally sharply forward to a depth of three inches.

May 10th, 1888, 70 ma. 12th, 70 ma. 14th, 75 ma. 16th, 70 ma. 18th, 55 ma. 21st, 80 ma. for 5 minutes each. As the period was coming on to-day, a change was made from the negative to the positive sound. The patient is more comfortable than usual at this time. 28th, 35 ma. for 5 minutes. A fairly good period. The patient is sleeping better, and she says that the tumor is smaller than it has been for a long time. 30th, 55 ma. for 5 minutes.

June 1st, 50 ma. 4th, 65 ma. for 5 minutes each. Is feeling very well, and the tumor continues to decrease in size. 6th, 8th, and 11th, 50 ma. for 5 minutes. 13th, 55 ma. for 5 minutes. The tumor is decidedly swollen to-day. 15th, 55 ma. 18th, 50 ma. 20th, 50 ma. 22d, 55 ma. for 5 minutes each. Feels uncomfortably swelled. 25th, 55 ma. for 5 minutes. A very light menstrual period has been followed by great comfort and diminution in the size of the tumor. 30th, 50 ma. for 5 minutes.

July 2d, 90 ma. for 5 minutes. Even on deep pressure the tumor cannot be felt from the abdomen. 4th, 75 ma. 6th, 65 ma. 9th, 70 ma. 11th, 70 ma. 13th, 65 ma. 16th, 60 ma. 18th, 65 ma. 20th, 65 ma. 23d, 65 ma. for 5 minutes each. In every way is much better.

July 5th, 1889.—"I have not written to you since December for I have had no time, and have had a terrible time of suffering and anxiety and nursing, which ended last month. My youngest sister died after many months of suffering. I have nursed her night and day. Since the beginning of January till 7th June I have been only four nights in bed! I am sure I should never have got through this last six months had it not been for your treatment last summer."

Case LXXXIX.—Married, age 45; was seen in consultation with Dr. Easton in May, 1888.

The history dated back to eleven years ago, as it was about that time that attention was drawn to the presence of an abdominal tumor, by occasional attacks of pain. Now, the lady says that she has not been free from pain for some years, and she cannot express how much the abdominal discomfort

and feeling of weight oppress her at all times. Indeed, she is so miserable that she often wishes that death might put an end to her suffering, for she has not any pleasure in living. She sleeps badly. She has always cold feet. At the periods all her pains and discomforts are greatly increased, and she loses more than she used to do, though there is really never much hemorrhage. At these times she is confined to bed for three or four days, and is never able to get up in the mornings, though naturally she is a very active woman. Some three or four years ago, she had a bad attack of phlegmasia dolens, and has never entirely lost the swelling of the leg. At the age of 42 a well-known abdominal surgeon was consulted. His opinion seems to have been very much against the probability of recovery, if an attempt had been made to remove the tumor.

The lady had tried everything that offered any hope of relief; she had spent two years at Kreutznach and the Riviera, and came home rather worse than better; she had also undergone a very painful course of treatment in a sort of vapor electrical bath, also without relief, and she thinks with decided increase in symptoms. She looks ill and worn, and there is great disfigurement.

On examination the tumor is found to be enormous; it is very hard and prominent, and extends up underneath the ribs, evidently for a long way, as the chest wall is very much raised. It is not possible to get even the tip of the finger between the tumor and the ribs or sternum. No measurements were taken until after the treatment was ended in the beginning of August, and at that time the lady found that she measured 35 inches. As she is slightly made, she ought to be probably about 22 or 23. The cervix was large, lacerated, and situated in the hollow of the sacrum.

The treatment was commenced with really little hope of benefit on the part of the patient and her friends, and consisted of the passage of the continuous current on thirty occasions. During eight of these operations the sound was made positive.

May 15th, 1888, 100 ma. 17th, 100 ma. 19th, 75 ma. 21st, 90 ma. for 5 minutes each. June 4th, 75 ma. for 5 minutes. There has been more flow and more distress than usual, during the period which is passed, and to-day the tumor seems to be very prominent at the upper part. 6th, 85 ma. 8th, 100 ma.

for 5 minutes each. The tumor is perhaps a little less hard than it was. 11th, 100 ma. 13th, 110 ma. for 5 minutes each. As it is nearly the time of the period, the sound was made positive. The tumor is not quite so tightly fixed under the ribs. 15th, 100 ma. 19th, 100 ma. 21st, 110 ma. 25th, 110 ma. for 5 minutes each. The application was made to-day at the lady's house, as the period is not quite over. Though the discharge has been free, she feels better than she usually does about this time. 27th, 135 ma. for 5 minutes. A marked lessening in the size of the tumor is noted to-day, and the patient feels decidedly more comfortable. 29th, 135 ma. for 5 minutes.

July 2d, 100 ma. 4th, 100 ma. 7th, 105 ma. 9th, 125 ma. 11th, 100 ma. 13th, 125 ma. for 5 minutes each. There is less heartburn, and on the left side there is a distinct depression between the chest wall and the tumor. The patient is able to sleep better. 16th, 135 ma. 18th, 125 ma. for 5 minutes each. The period has just begun. The tumor has never been so small, and there is a depression between it and the sternum, as well as on both sides. 23d, 125 ma. for 5 minutes. The period has been much as it used to be before the treatment was begun. 25th, 120 ma. 27th, 110 ma. 30th, 110 ma. for 5 minutes each.

August 1st, 110 ma. 3d, 125 ma. 6th, 115 ma. for 5 minutes each. The tumor is quite free of the ribs, and does not seem to be half the size it formerly was.

Extract from letter, dated 28th September.—"Just a few lines to tell you I have returned from North Wales, and am feeling much better and stronger than when you saw me last, early in August. I have had two severe periods, which weakened me for the time; but I have been very free from pain, and can sleep so much better. My friends here say I am looking so different, and I feel I have gained so much in nerve lately. I can also walk better, and the veins have not been so troublesome."

December 7th.—"I cannot express all the gratitude I feel for my improved health. I am glad to tell you that I am slightly smaller since I saw you, and find I am 29 inches only round the waist—in August I measured 35 inches, so I am really now not at all remarkable in figure, and much more comfortable."

July, 1889.—The lady is not so well as she was in December last, and has still a great deal of discomfort during the periods. The tumor is also larger than it was at that time. In every way she is better than she was eighteen months ago, but we propose to further reduce the size of the mass by some treatment.

Case XC.—Single, age 36; was sent by Dr. Lett, of Wakefield, in May, 1888.

For ten years there has been an excessive loss of blood at the periods, and eight years ago the tumor was first noticed. The periods last six days usually; for two of these the loss is very great, and the patient is confined to bed for two or three. Sixty or seventy diapers are always required. As the flow ceases there is great sickness accompanied by pain, and for this she has required to have hypodermic injections of morphia for two or three days every month. Between the periods there is an almost constant and profuse leucorrhœal discharge, and the lady is seldom dry for even a few hours together.

As far as strength goes, she can walk well, but even on level ground she cannot go far, as severe palpitation is set up.

The patient is seen to be terribly anæmic, and on examining the abdomen the tumor, which is not specially prominent, is found to extend up to well under the ribs and sternum. The sound passes fully 6 inches.

Dr. Lett writes that the tumor has been growing more rapidly of late. Everything in the shape of drugs has been tried without any permanent effect, with the exception of the morphia, which is required for the sickness.

The treatment consisted in thirty positive applications.

May 18th, 40 ma. for 5 minutes.

June 12th, 80 ma. for 5 minutes. A severe cold has prevented anything being done for the last three weeks. In the mean time, the period has been got over rather more easily than usual. 14th, 85 ma. 16th, 95 ma. 19th, 85 ma. for 5 minutes each. The patient thinks that she begins to feel a little better and stronger. 21st, 110 ma. 23d, 135 ma. 25th, 110 ma. 27th, 125 ma. for 5 minutes each.

July 11th, 85 ma. for 5 minutes. The period this month has been better in every way—less hemorrhage, pain, and sickness; and it was five days later than it should have been. 13th, 100 ma. 17th, 75 ma. for 5 minutes each. There was an

attack of diarrhœa yesterday, and to-day the tumor is tender to the touch. 19th, 110 ma. 21st, 135 ma. for 5 minutes each. There is seldom any palpitation while walking on level ground now. 23d, 135 ma. 25th, 120 ma. 27th, 80 ma. for 5 minutes each.

August 4th, 95 ma. for 5 minutes. There has been as much flow as last time, but unaccompanied by sickness and palpitation. The patient feels stronger, and has a little color. 6th, 90 ma. 11th, 115 ma. 13th, 85 ma. 15th, 110 ma. 17th, 120 ma. 21st, 120 ma. for 5 minutes each. The lady is very well, and goes to the seaside for a month, so as to have a change before the summer is over.

September 27th, 90 ma. for 5 minutes. There was so little pain at the last period that only one morphia pill had to be taken. The quantity of discharge was rather more than half what it used to be before the treatment. 29th, 100 ma. for 5 minutes.

October 1st, 80 ma. 3d, 75 ma. 5th, 100 ma. 8th, 90 ma. for 5 minutes each. The patient says that she feels quite well, and able to do anything.

Extract from letter dated 28th August, 1888: "I think I have a very good report to give of myself on the whole. I began as usual two days too soon, and the hemorrhage seems to be the stubborn point with me. The first two days I thought I was going to be wonderfully better in that respect, but it went on longer, and consequently I don't think I had any less than the time before. In every other respect I am very much better. No morphia injected (I think I have only been without it about three times in eight years). No sickness; certainly decreasing in size, indeed 'getting a figure,' and, of course, less weakness afterward. I think I have got nearly as much faith in electricity now as you have."

September 24th, 1888.—"I have nothing but good to report."

November 21st, 1888.—"I have not any rapid progress to report, but on the whole it is fairly satisfactory, I think. The last period I had a little more in quantity than the time before. Last time I had about fifty-six diapers, the time before about forty-three; but that is the worst point in my case. The pain keeps marvellously better, and I have not had any morphia injected. Each time I had two or three little pills

with morphia, which was quite enough to check the pain I had. It does not continue as it did either, only as a rule lasting a few hours—about twenty-four after I have begun. Dr. Lett measured me after I had got over the worst, and he found me 4 inches less than I was. Everything but the hemorrhage seem to be going on satisfactorily; that, of course, is still more than it should be. I feel very well in between."

On 10th December Dr. Lett wrote: "Her periods are much better—fairly free from pain and nausea—but the hemorrhage is still excessive. Internal remedies have been all tried, and failed."

On the 15th February, 1889, we had the following account: "Miss ——'s last few periods have been marked by nausea, continuing from the second day for six or seven days; also neuralgic headache, the effect apparently of anæmia. I think the hemorrhage last time was not in the aggregate so profuse as in the old days before you saw her; but last time it was very profuse indeed during twelve hours. I suppose the total number of 'changes' is one-quarter less, but the constitutional effect is not less. Pain is now quite trifling.

"The last period but one was peculiar. After a fair beginning, she felt nearly well about the fourth day, and got up and about—all the time with nausea and a feeling of 'not getting well nicely;' occasionally passing a small elongated clot, with nearly white discharge between. When I saw her she was decidedly ill, and was sent to bed. Next day there were pain and tenderness over the tumor, especially at one circumscribed spot, above and in front, where I found fluctuation (this has gone). Temperature, 102.2°; pulse, 124; and vomiting. Very like metritis. She was not perfectly free from occasional pink discharge for a fortnight after the beginning of menstruation, and the next (the last) period began five weeks after the other. One week late for the first time in her experience."

The patient was seen again on the 16th February, and it was decided to wait for at least one other period before doing anything more. The tumor did not extend up to the ribs at any point.

March 9th, 1889.—"I believe in electricity! Here is my report. I came from Eastbourne feeling splendid, and looking a new creature. My period came on on Monday morning; pain

soon subdued; no sickness; and only thirty-six diapers in all; and four days only it lasted. It went yesterday morning. I have stayed in bed, for I have feared to spoil the record. I do believe now I shall go on to perfection. My body is perfectly soft and natural."

May 8th.—Since the last note there has been but one period after an interval of seven weeks. There was not any pain, and the loss was comparatively little, not more than twenty diapers being required, and the lady was going about the whole of the time. She says that she is perfectly well, and that the tumor is becoming smaller.

Case XCI.—Single, age 40; was first seen in May, 1888.

The history dated back to two years ago, when the lady finds that she had noted down that she was losing more blood at the monthly periods than was habitual with her, and that instead of lasting seven days the flow continued for nine. Eight months ago the tumor was first noticed, and during the last two months it has been growing with great rapidity. Lately there has been a painful tired feeling across the back and discomfort in the right leg and hips. For a week or so before the appearance of the menstrual flow, the patient is much troubled by flatulence and discomfort after eating. It is not, however, so much on account of the present symptoms that the patient is anxious to have some treatment, but is owing chiefly to having seen the great suffering, which these fibroid tumors of the uterus may cause, in the person of an older sister, who has quite lately undergone a six-months' course of electrical treatment, apparently after Apostoli's method. This sister is improving; but as the treatment and the menopause came about the same time, it is probable that the latter has as much to do with the improvement as the former.

The tumor reaches up to the margin of the ribs all round, and is decidedly prominent.

May 25th, 1888, 100 ma. 28th, 110 ma. 30th, 120 ma. for 5 minutes each.

June 2d, 120 ma. 4th, 130 ma. 6th, 150 ma. for 5 minutes each. The tumor appears to be rather smaller, and there is scarcely so much dyspepsia as usual about this time. 16th, 125 ma. for 5 minutes. There has been more flow than usual, and accompanied by more pain; the usual headache has not

been so bad. 18th, 130 ma. 20th, 110 ma. for 5 minutes each. The tumor is now quite free of the ribs. To-day the internal sound was made negative instead of positive, as it has been before. 22d, 140 ma. for 5 minutes.

July 2d, 100 ma. for 5 minutes. There has been more than the average amount of bleeding. 11th, 90 ma. 13th, 110 ma. 16th, 135 ma. 18th, 110 ma. for 5 minutes each. The tumor is smaller, and the patient is more comfortable. 20th, 125 ma. 23d, 120 ma. 25th, 120 ma. 27th, 110 ma. for 5 minutes each.

August 13th, 85 ma. for 5 minutes. In every way the period has been better, and the patient feels well. 15th, 105 ma. 18th, 105 ma. 22d, 100 ma. 28th, 125 ma. for 5 minutes each. The period has been much the same as the last. 30th, 125 ma. for 5 minutes.

September 1st, 125 ma. 3d, 145 ma. 5th, 125 ma. 7th, 125 ma. 16th, 125 ma. for 5 minutes each. The tumor extends to barely 2 inches above the umbilicus, and does not reach more than 3 inches to the left of the middle line.

March, 1889.—At first the patient was in every way much better, but for the last two months there has been much more discomfort, with a return of the old symptoms. The tumor is larger than when seen some months ago, and reaches to fully 3 inches above the umbilicus. 5th, 60 ma. 7th, 100 ma. 9th, 90 ma. 11th, 100 ma. 13th, 100 ma. 15th, 110 ma. 18th, 120 ma. for 5 minutes each.

April 2d, 100 ma. for 5 minutes. The period has been very much as usual. 4th and 6th, 105 ma. for 5 minutes. 8th, 105 ma. 10th, 110 ma. 12th, 125 ma. for 7 minutes each. In the mean time the treatment is to be discontinued, but will probably be recommenced later on.

Case XCII.—Married, age 59; was seen with Dr. Robson Roose.

This lady has suffered for many years from constipation. She has tried every known drug and every known method of treatment, and nothing has ever been of the slightest service, and the bowels are now moved with great difficulty by the help of very copious injections. Dr. Allan, of Brighton, was the first to suggest that the original cause of the constipation might have been the presence of an uterine fibroid, which had never apparently given rise to any trouble. Dr. Roose concurred, and the lady was willing to try the experiment, and

have the tumor reduced in size. It was determined to make fifteen negative applications, and to wait and see if there were any improvement before continuing with the treatment.

The tumor itself was of stony hardness, and was situated in the left side, extending up to 2 inches above the level of the anterior iliac spine. It was absolutely immovable, and appeared to be almost continuous with the iliac bone. From the vagina, also, not any movement could be felt.

June 6th, 1888, 50 ma. 8th, 65 ma. 11th, 75 ma. 13th, 75 ma. 15th, 100 ma. 18th, 100 ma. 20th, 115 ma. 22d, 135 ma. 23d, 135 ma. 25th, 115 ma. 27th, 130 ma. 29th, 135 ma. 30th, 135 ma. for 5 minutes each.

July 2d and 3d, 150 ma. for 5 minutes. The tumor is now up to the level of the anterior iliac spine, and is not quite so fixed.

November.—Although the constipation has not improved, both the lady and her doctor wish to repeat the course of treatment, as there has been a marked improvement in the condition of the tumor. It is now quite separate from the bone, and the patient's masseuse has remarked that there is now a hollow between the ilium and the tumor. 9th, 85 ma. 10th, 90 ma. 12th, 70 ma. 13th, 75 ma. 15th, 140 ma. 17th, 125 ma. 19th, 125 ma. 20th, 135 ma. 23d, 125 ma. 24th, 125 ma. 26th, 110 ma. 27th, 130 ma. 29th, 120 ma. for 5 minutes each.

December 1st, 125 ma. 3d, 145 ma. for 5 minutes each. The tumor is now freely movable. It does not reach up to within 2 inches of the level of the anterior iliac spine, and the hand can be passed between it and the tumor.

June, 1889.—The general health is much improved.

Case XCIII.—Married, age 45; was sent by Dr. Matthews Duncan.

The patient had suffered for several years from gradually increasing debility, due chiefly to the presence of a small fibroid tumor of the uterus, which gives rise to excessive losses at the periods.

The fundus was found to reach to 2 inches above the pubes, and it was difficult to introduce the sound on account of the position, and also to a flexion of the cervix.

June 2d, 1888, 50 ma. 14th, 50 ma. 16th, 50 ma. 19th, 60 ma. for 5 minutes each. The lady is rather better, and her

maid says that she is certainly stronger. 21st, 55 ma. 23d, 65 ma. 25th, 75 ma. for 5 minutes each. There has been a decided improvement in the general condition. 27th, 75 ma. 29th, 55 ma. for 5 minutes each.

July 10th, 65 ma. for 5 minutes. The period has been much better than usual. 13th, 60 ma. 16th, 60 ma. 18th, 50 ma. 20th, 50 ma. for 5 minutes each.

The lady was very anxious to get out of town, and was to come back to renew the treatment if she did not continue to improve. She was never able to bear a strong current, and it will be observed that the average strength of the fourteen applications was scarcely 60 ma. In every case the sound was made positive.

Case XCIV.—Single, age 47; was seen first in June, 1888.

The history may be best given in the patient's own words: "After six or seven years of excessive hemorrhage and rather quick periods, I had very violent discharges with very large clots, and on March 31st, 1886, Dr. Godson was telegraphed for, and he plugged me. During the remainder of that year I had regular but excessive periods, and was in bed a week each time. During 1887 much longer times of hemorrhage, and seldom free more than three or four weeks. During the last Christmas holidays I was only out of my room seven times in four weeks. From January 15th to May 15th I have spent about eight weeks in bed or on my couch, and now I am getting bad again."

The patient is a big-made woman; decidedly anæmic. She says that she cannot walk farther than a hundred yards, partly on account of weakness, and partly from a very severe pain in the back, which walking or driving sets up.

On account of the thickness of the abdominal wall, it is not easy to feel the tumor, which, however, extends up to above the umbilicus. The sound passes 5½ inches, and the cavity is large from side to side.

June 14th, 1888, 75 ma. 16th, 80 ma. 19th, 85 ma. 21st, 75 ma. 23d, 85 ma. for 5 minutes each. Is a little stronger, and has not quite so much backache. 25th, 85 ma. 27th, 85 ma. 29th, 90 ma. for 5 minutes each.

July 2d, 90 ma. 4th, 100 ma. 6th, 95 ma. for 5 minutes each. Friends notice that the patient is looking much better. 9th, 100 ma. 11th, 100 ma. 13th, 100 ma. for 5 minutes each.

To-day was the first application, after which there was not any backache; and yesterday the lady had what she now considers a good long walk. 16th, 100 ma. 18th, 110 ma. 20th, 90 ma. 23d, 125 ma. 25th, 110 ma. 27th, 125 ma. 30th, 130 ma. for 5 minutes each.

August 1st, 115 ma. for 5 minutes. Yesterday the lady walked farther than she has been able to do for the last two and a half years. 3d, 115 ma. 11th, 110 ma. for 5 minutes each. The red discharge lasted for one day only, and was followed by a profuse leucorrhœal flow. There was little discomfort, and the tumor is smaller. 13th, 115 ma. 15th, 95 ma. 17th, 120 ma. for 5 minutes each. There is some decidedly fœtid discharge. On the 23d inst. a mass, described as looking like a piece of tumor, came away, and this was followed by rapid improvement both in the quantity and character of the discharge.

Extracts from letters:

September 17th.—"I have been waiting to report myself until I could send a clean bill of health. I think I may do so now, as I feel better in every way, and have only a little white discharge. Of course I feel pretty tired by the time evening comes."

November 13th.—"I had seven such good weeks—so well and comfortable—able to get up and down stairs each day. I was waiting then to write to you until some sort of period came. On the 2d there was a small commencement, and the next three days still quite a normal quantity. I ventured out, and in the evening I had pain, deluge, and two clots; next day rather violent too. Thursday—I syringed away two clots. Friday—a little better. Saturday—twelve hours of acute backache; and on Saturday night such a hemorrhage, all through Sunday and Monday. To-day—decreasing; but, instead of being clear, bright red, it is muddy and offensive. Disappointing, isn't it?"

March 4th, 1889.—"I am recovering from another terrible time of tribulation. I had a quiet, normal sort of period toward the end of January; and after a few days I had the most terrible pains, all around my loins and nearly down to my knees, lasting many hours at a time. It was so acute that it seemed as if all the veins and muscles in those parts were being tightly drawn out. This was all accompanied by great

lumps of discharge, and lasted two and a half weeks (from 2d to 20th of February), and then I began to get better. I had to get my doctor several times. I could not bear the pain. He gave me opium pills."

May 13th.—The last period has been very much better, and the patient feels now that she is making progress. The tumor is about one-third less than it was before treatment.

Case XCV.—Married, age 27; was first seen in July, 1888.

This lady was not aware that there was anything the matter with her pelvic organs, until she had a miscarriage a year ago. Since that time, there has been more flow at each succeeding menstrual period, and there is also more or less pain complained of in the left side. She has come home from South America for a few months, and is most anxious to be made quite well before she returns, more especially as she is very much troubled with asthma. A month or six weeks ago the tumor was examined both by a practitioner in the country, and by the obstetric physician of one of the large hospitals. Both of those gentlemen passed a sound, and both found that it entered to a depth of 4½ inches. We found that a sound passed 6 inches, so that the tumor either was growing with great rapidity, or what is more likely is, that measurements made by different people, or even by the same person at different times, cannot always be relied on. The sound appeared to have entered as far as it would go at 4½ inches, and then by a little manipulation it was found that the direction of the cavity changed, and that the sound passed for another inch and a half. This shows the fallacy of insisting on a reduction in the size of a cavity before a satisfactory result can be claimed. The tumor, immediately after menstruation, extended up to 1 inch above the umbilicus.

As the lady's time in this country was short, she went out visiting and to theatres, exactly as she would have done had she been quite well. A greater number of applications than the average were made, simply because the patient had so far to go home, and could not have more of the treatment if required. There were in all thirty-eight, the sound being attached to the positive pole of the battery.

July 7th, 1888, 100 ma. 10th, 120 ma. 12th, 120 ma. 14th, 135 ma. 17th, 135 ma. for 5 minutes each. The tumor is smaller than it has yet been. 19th, 145 ma. 21st, 175 ma.

23d, 170 ma. 25th, 150 ma. 28th, 150 ma. for 5 minutes each. The period has been bad for only two days. 31st, 135 ma. for 5 minutes.

August 2d, 130 ma. 6th, 110 ma. 14th, 100 ma. for 5 minutes each. There has been a good deal of colicky pain in the womb for the last few days. 16th, 100 ma. 18th, 120 ma. 21st, 105 ma. 23d, 120 ma. for 5 minutes each. The period is just on, and the tumor has not swelled up to as high as the umbilicus. 25th, 105 ma. 28th, 135 ma. 30th, 135 ma. for 5 minutes each. The lady feels very well, and the tumor continues to decrease.

September 4th, 120 ma. 6th, 140 ma. 8th, 135 ma. 11th, 110 ma. 13th, 135 ma. 15th, 125 ma. 18th, 120 ma. 22d, 120 ma. for 5 minutes each. The period is over; there was not so much, but there were clots. The tumor has never been noticed to be so small as it now is. 25th, 120 ma. 27th, 130 ma. for 5 minutes each.

October 2d, 150 ma. 4th, 120 ma. 6th, 125 ma. 9th, 115 ma. 11th, 115 ma. 13th, 110 ma. 20th, 120 ma. for 5 minutes each. The period has been much the same as the last. The cavity measures 5 inches. At about 4 there is the obstruction which has always been felt.

The lady went home to South America, and wrote on January 17th, 1889, "I think, on the whole, I may say I am fairly well, though I must confess that such a complaint as mine is a decided 'thorn in the flesh,' and gives me a good deal of inconvenience and pain. In December I was certainly better; but this month I had a bad time, so naturally feel somewhat depressed."

At the end of three months or so, it is not at all uncommon to get an account such as this.

Case XCVI.—Single, age 44; was first seen with the late Dr. Sidey some years ago.

When about the age of 32, it was noticed that the losses every month were increasing, and eight years ago the lady first became aware of the presence of a tumor in the abdomen. For a great many years there has been a very bad pain in the right side, and at times the flooding and the pain have both been so severe that the patient did not dare to move, and only obtained relief after a three-quarter-grain dose of morphia had been injected under the skin. There were several reasons

which prevented this lady seeking relief by operation, though she was often almost forced to have something done. Two years ago she was sent to Spain for several months, and returned very much improved in every way—less pain, less hemorrhage, and stronger generally. This improvement was, unfortunately, of a temporary character, and before long the lady was back again to the old condition of anæmia and weakness.

In July, 1888, the tumor was found to extend to two inches above the umbilicus. It was very prominent, and on the right side it extended very far back into the loin, and appeared to be immovably fixed in that position. The tumor filled the whole of the pelvis, coming quite low down. There was no cervix, and the os uteri was felt to be situated rather more in front than usual. The cavity was large, but it appears that its exact depth was never recorded.

The treatment consisted in twenty-five applications, during all of which the sound was made positive.

July 24th, 26th, and 28th, 1888, 80 ma. for 5 minutes.

August 1st, 85 ma. 3d, 85 ma. 6th, 80 ma. 11th, 95 ma. for 5 minutes each. After every application there is a very considerable amount of backache complained of for several hours, and it is worthy of note that though this lady was able to suffer great pain without making much complaint, yet she could not stand a strong current of electricity. The tumor is smaller and is somewhat movable. 13th, 85 ma. 15th, 120 ma. 17th, 75 ma. 20th, 125 ma. 23d, 130 ma. for 5 minutes each. The tumor has partly rotated; there is now some slight appearance of a cervix, which is situated rather farther back in the pelvis than natural. On account of the altered position of the tumor, the patient was assured that she would not have any backache. 25th, 150 ma. for 5 minutes. There was not any backache after the last application. The tumor does not reach up to the umbilicus, and has become lobulated. 27th, 115 ma. for 5 minutes. The tumor appears to have become smaller in the last two days, and instead of there being a mass fixed in the right side, that flank is now entirely free of tumor. 31st, 75 ma. for 5 minutes. Menstruation has come on freely, and for the first time for many years there has been neither pain nor sickness; and, although the sickness usually prevents the patient taking food for three days, she has not missed a meal.

September 10th, 100 ma. for 5 minutes. On the 1st of the month, the lady, thinking that the period was over, went out for a walk, but had not gone far, when she was seized with a severe pain in the tumor, and had to drive home at once. The flow returned, and on two occasions morphia had to be injected. 12th, 14th, and 17th, 100 ma. for 5 minutes. 19th, 80 ma. for 5 minutes. 21st, 50 ma. for 10 minutes. 29th, 65 ma. for 5 minutes. The loss has been decidedly great, but unaccompanied by either pain or sickness.

October 1st, 115 ma. 3d, 140 ma. 5th, 100 ma. for 5 minutes each. The tumor is now less than half the size it was in July. 6th, bleeding came on during the night, and was accompanied by severe pain. 9th, the hemorrhage has been very profuse, and morphia has had to be injected four times. The tumor has been steadily swelling up, and is to-night as large as it was before the commencement of the treatment. 10th, the patient woke about four A.M., and found to her astonishment that the tumor was not half the size it had been when she went to sleep, although there had been less discharge, and no clots had been passed. 18th, went home to Edinburgh, looking certainly more ill than she did, when she left it three months before.

After getting home there were two bad periods. By the 21st January, 1889, she was able to write, "It means a different life for me, what you have done."

April 13th.—"Every day I announce to myself that it is a miracle—no more and no less. I am perfectly well, gradually getting quite active, and have a permanent color. I think there have been two periods since New Year, but so slight that I scarcely recognize them as such. Before the last, the tumor had got very small; then at the period it was distended a little, but is beginning to go down again. Its being distended was about the only thing by which I knew it was a period. You remember what an object I was at the end of the treatment, and now I think I am just as much the other way."

May 3d.—Looks splendidly well, and says that it is at least twelve years since she felt as she does now, and tells me that she has been working hard all winter.

Case XCVII.—Married, age 45; came over from Boulogne in the beginning of August, 1888.

This patient had always been a fragile, delicate woman, and

for twenty years has been unable to live in England on account of bronchitis, asthma, and occasional attacks of pleurisy.

For some eight or ten years there has been menorrhagia, which had been increasing steadily year by year. Six years ago, the tumor was first noticed, and it is slowly growing larger and larger, and is now, she thinks, beginning to affect her breathing. The periods last, as a rule, for fourteen days, and the increased flow is a serious drain under the circumstances, though a strong woman would not be much affected by it. A frequent desire to pass water is also much complained of.

The tumor extends to 2 inches above the umbilicus, and descends very far into the pelvis, and presses on the bladder. There is not any cervix, and the os is reached with some little difficulty. The whole of the right side of the abdomen is tender.

August 3d and 6th, 50 ma. for 3 minutes. 13th and 15th, 45 ma. for 4 minutes. 25th, 70 ma. for 5 minutes. The period is over, and has been very much the same as usual. 27th, 60 ma. 29th, 60 ma. 31st, 55 ma. for 5 minutes each.

September 3d, 65 ma. 5th, 70 ma. 7th, 70 ma. for 5 minutes each. There is perhaps a little improvement in the general condition, and the tumor is certainly smaller. 10th, 65 ma. 12th, 55 ma. 20th, 75 ma. for 5 minutes each. The period has been again much the same. 22d, 60 ma. 27th, 55 ma. for 5 minutes each. There has been a great deal of pain complained of in the tumor. 29th, 80 ma. for 5 minutes.

October 1st, 60 ma. for 6 minutes. There has been a marked improvement in comfort in the last few days. 3d, 65 ma. 5th, 80 ma. 8th, 65 ma. 16th, 70 ma. 18th, 70 ma. for 5 minutes each.

There was not any improvement in the period this month in the amount of hemorrhage. The tumor is now barely up to the umbilicus, and is fully one-third smaller than it was. The lady fears to remain in London longer, and goes to Falmouth for the winter.

November 27th.—"You may possibly be expecting a report from me of myself, but I really have nothing good to say. After I came here, the period came on, nine days too soon, and the next time, fifteen days too soon, and it has not ceased at all, nor seems likely to do so. The loss has been far greater than ever in my life."

February 27th, 1889.—"Since I wrote you, nearly three months since, I have steadily grown worse—loss greater, period longer."

In April this lady came back to town, and the menstrual flow did not appear for five weeks, and the quantity was comparatively slight. An attempt was made to continue the treatment. The passage of the current could not be borne, unless while the lady was under the influence of morphia. Unfortunately, however, the action of the drug, which had to be given in large doses, was too depressing, and also caused considerable œdema of the lungs.

In May, there was a greater loss, but almost no pain, and it was considered advisable to send the patient to the country, as she is unable to be out of the house for the seven or eight cold months of the year.

The tumor is slightly larger than it was in October of last year; though still much smaller than it was before treatment.

Case XCVIII.—Married, age 46; was seen with Dr. Straton, of Wilton, in August, 1888.

The patient had been aware of the presence of a tumor in the abdomen for about nine years. At first it gave rise to little or no inconvenience, but of late years it has caused a great deal of discomfort and pain. Within the last two months the growth has been so rapid that dresses have had to be let out six inches. The pain has been so acute on the left side for the last five or six weeks that poultices have had to be kept almost constantly to the part. There has not been any menorrhagia.

The tumor is a very large one, and its weight is probably nearer forty than thirty pounds. It is immensely broad from side to side, and extends very high up under the ribs and sternum, raising the thoracic wall enormously. The tumor extends deeply into the pelvis, and an enormous artery is felt close to the cervix, which is itself small, and situated well up on the right side. The cavity measures about 5 inches. The weight of the mass has prevented the patient taking much exercise, and since the rapid increase in size a couple of months ago, she has been scarcely able to walk.

The treatment consisted in thirty applications, in all of which the sound was made negative. The strength of current was never great, averaging slightly over 90 ma.

August 4th, 6th, and 11th, 45 ma. for 5 minutes. Feels certain that she is stronger, and can move about rather more easily. 13th, 60 ma. 15th, 75 ma. for 5 minutes each. For the first time for fully two months the patient was able to go out for a short walk, and there is less pain. 17th, 85 ma. 20th, 55 ma. for 5 minutes each. There has been a decided increase in the amount of pain in the tumor, but unaccompanied by any inflammatory symptoms. 25th, 75 ma. for 5 minutes. There has been an easy period, with rather more discharge than usual. There is a marked decrease in the amount of bulging in the flanks; the patient can button a dress which was much too tight for her a couple of weeks ago, and there has not been any pain at all for two days. 27th, 95 ma. 29th, 95 ma. 31st, 100 ma. for 5 minutes each. The skin over the tumor is much less tense than it was.

September 3d, 110 ma. 5th, 125 ma. 7th, 100 ma. for 5 minutes each. The tumor is almost free of the ribs. 13th, 100 ma. for 5 minutes. There has been again rather a greater loss than usual. 15th, 130 ma. 17th, 110 ma. 19th, 100 ma. 21st, 115 ma. 24th, 110 ma. for 5 minutes each. The patient says that she feels very well, and the tumor continues to decrease rapidly in size. 26th, 100 ma. 28th, 110 ma. for 5 minutes each.

October 1st, 90 ma. 3d, 115 ma. 5th, 110 ma. 9th, 110 ma. 13th, 80 ma. 15th, 70 ma. 17th, 70 ma. 19th, 75 ma. for 5 minutes each. The tumor is not half the size it was, and the improvement in the general condition and appearance is so great, that a friend remarked, that surely the days of miracles had returned.

December 2d, 1888.—"I am sorry I cannot give a good report of myself. I am not nearly so well as when I left London; in fact, I have been obliged to spend most of my time in bed, as when I walk or move about I have such a bad dragging pain in the left side."

February 6th, 1889.—"I am pleased to tell you I am so much better than when I wrote last; in fact, the first fortnight of the month I feel quite well, and my stomach is so much smaller. For the next ten days it gets larger, with some pain in my left side; but each month there is less pain, and the tumor itself is much smaller."

May.—"I am pleased to tell you I feel much better and

stronger in myself, and my stomach is much smaller three weeks at a time; but the fourth week it gets very large, and a good deal of pain; but every one says how much better I am looking."

Case XCIX.—Single, age 39; was sent by Dr. Wilson, of Gateshead, in October, 1888.

For several years the general health had not been at all good, and increase of menstrual discharge led to the discovery of a fibroid tumor of the uterus three years ago. The patient says that she feels tired, if she exerts herself, even slightly, and that she has a constant feeling of fulness with discomfort and pain especially during menstruation. Sleeps badly. The tumor extends to two inches above the umbilicus on the left side, and on the right it almost touches the ribs. It is slightly irregular in outline. The tumor descends deeply into the pelvis, the cervix is far back, and the passage of the sound is not easy.

October 11th, 1888, 70 ma. 13th, 60 ma. 15th, 85 ma. 17th, 65 ma. for 5 minutes each. Is already sleeping better. 19th, 90 ma. 22d, 70 ma. for 5 minutes each. The lady thinks that the tumor is smaller, and she says that she feels better.

November 2d, 75 ma. for 5 minutes. There has been fully as great a loss as usual. 5th, 65ma. 7th, 75 ma. 9th, 85 ma. for 5 minutes each. The tumor is smaller and the lady feels stronger. 12th, 80 ma. 14th, 90 ma. 16th, 95 ma. 26th, 65 ma. for 5 minutes each. The period has been much easier than usual, and there has not been any headache. This has been, of late years, a constant accompaniment of menstruation. 30th, 80 ma. for 5 minutes.

December 3d, 95 ma. 5th, 80 ma. 9th, 70 ma. 10th, 70 ma. for 5 minutes each. On the left side in particular, there is a marked lessening of the tumor. 19th, 85 ma. for 5 minutes. The patient is in capital spirits, as she has had the best period for quite a number of years, and there has not been any headache. 21st, 100 ma. 24th, 80 ma. 26th, 80 ma. 28th, 70 ma. for 5 minutes each.

January 9th, 1889, 55 ma. for 5 minutes. There has been rather a greater flow of blood this time, but in spite of it, the lady feels very well. 11th, 60 ma. 14th, 70 ma. 16th, 60 ma. 18th, 85 ma. 23d, 60 ma. 25th, 75 ma. for 5 minutes each. Is now very well. On the right side the tumor is not within

2½ inches of the ribs, and does not extend so far toward the back. On the left, there is a clear space between the ilium and the tumor, and the growth has become more lobulated.

July 10th.—To-day the lady called to say how well she was, and said that it was such a comfort to go about and not have the old tired feeling. She said that the tumor was becoming smaller.

Case C.—Single, age 40; sister of the lady whose case is No. XCIX.; was sent by Dr. Wilson, of Gateshead.

For several years the patient has not felt well; she is always tired, and instead of being an active woman is slowly but steadily becoming an invalid. While she is not what might be called ill, yet she is unable to have much pleasure in living. There is not any menorrhagia. On examination, the tumor is found to be of moderate size, extending up to the umbilicus.

Though older than her sister, the tumor is either of later or of slower growth. Like her, she was not able to bear a strong dose of electricity; the average in the older lady being scarcely 80 ma., while in the younger it was slightly over 75. In both, the sound was always attached to the positive pole, and both are entirely pleased with the result of the treatment.

October 24th, 1888, 60 ma. 26th, 75 ma. 29th, 80 ma. 31st, 85 ma. for 5 minutes each.

November 2d, 85 ma. 7th, 85 ma. 16th, 75 ma. for 5 minutes each. An easy period, unaccompanied by headache. 19th, 65 ma. 21st, 75 ma. for 5 minutes each. Dr. Wilson was in town, and was much pleased with the progress that had been made. 23d, 80 ma. 26th, 85 ma. 30th, 80 ma. for 5 minutes each. The lady and her sister should have had an application on the 28th, but they could not come, as they had some friends staying with them, and had too much to do!

December 3d, 85 ma. 5th, 80 ma. 17th, 70 ma. for 5 minutes each. Again there has not been any disturbance at the period. 19th, 95 ma. 21st, 80 ma. 24th, 85 ma. 26th, 80 ma. 28th, 85 ma. for 5 minutes each.

January 18th, 1889, 75 ma. 23d, 70 ma. for 5 minutes each.

July 10th.—Says that she is very well.

Case CI.—Married, age 30, was recommended by Dr. John Duncan, of Edinburgh, and was first seen in October, 1888.

A tumor was discovered after the birth of one of the chil-

dren three years ago. In May a dead child was born, and since then there has been too much blood lost every month. The tumor is said to be growing rapidly. For ten years there has been dysmenorrhœa, and of late the pain has been getting much worse.

The tumor reaches to within 2 inches of the umbilicus, and extends far out on the right side, and has probably opened up the broad ligament.

October 18th, 1888.—100 ma. 20th, 100 ma. 22d, 75 ma. 24th, 100 ma. 26th, 120 ma. for 5 minutes each.

November 3d, 100 ma. for 5 minutes. There has been rather less flow, and accompanied by less pain, than for ten years. 5th, 120 ma. 7th, 140 ma. 9th, 145 ma. 12th, 145 ma. for 5 minutes each. The lady feels sleepy and disinclined for exertion in the afternoons of the days on which she has the treatment. 14th, 145 ma. 16th, 140 ma. 19th, 150 ma. 21st, 155 ma. 23d, 155 ma. for 5 minutes each.

December 4th, 135 ma. for 5 minutes. The period has been much the same as usual, except that there was less pain. The lady is to come up to town three times a week, a distance of one hour by train. 8th, 105 ma. 11th, 125 ma. 13th, 110 ma. 18th, 110 ma. 20th, 150 ma. 22d, 140 ma. for 5 minutes each.

January 1st, 1889, 120 ma. for 5 minutes. The period has not been such an easy one as the last. 3d, 130 ma. 5th, 135 ma. 8th, 100 ma. 10th, 130 ma. 12th, 120 ma. 15th, 120 ma. 17th, 125 ma. for 5 minutes each.

February 23d.—"I am just getting over my 'monthly,' and am sorry to say I have been quite as ill this time."

July 12th.—"I am glad to say I feel very well."

Case CII.—Married, age 42; was sent by Dr. Graham, of Currie, N. B., in the beginning of the winter of 1888.

For the last few years this lady had not been feeling very well, and suffered much from dyspeptic symptoms. Treatment seemed to do little good, and the patient did not mention for a long time that she had considerable irritability of the bladder, necessitating her getting up at least four times during the night, and that there was also difficulty in defecation. As soon as those symptoms were spoken of, the tumor was discovered. For the last few months, there have been feverish attacks every month, during menstruation, due, the lady thought, to her getting cold when she had to get up during

the night. Often, on going to bed feeling very tired, the patient felt certain that nothing would wake her, but for some years she has never got beyond one o'clock. She cannot sit comfortably, more especially when driving. There is not any menorrhagia.

The tumor fills the pelvis, and extends to 2 inches above the pubes. The sound enters easily about 5 inches.

November 1st, 1888, 65 ma. 3d, 85 ma. for 5 minutes each. Patient says that she feels better, and she had to empty the bladder once only last night. 6th, 85 ma. 8th, 75 ma. for 5 minutes each. Slept better last night than she had done for years, and instead of waking at one o'clock, slept on till five. 10th, 90 ma. 13th, 80 ma. for 5 minutes each. The lady says that she does not require to take any thought how she sits; she is perfectly comfortable. 20th, 75 ma. for 5 minutes. The period is over; there has been rather more flow than usual, but accompanied by much less pain. 22d, 85 ma. 24th, 90 ma. 27th, 90 ma. 29th, 100 ma. for 5 minutes each.

December 1st, 95 ma. 4th, 80 ma. 6th, 100 ma. 8th, 90 ma. 11th, 90 ma. for 5 minutes each. The period is due, and the patient states that she feels better than she has done for many years; usually at this time of the month, she has felt very uncomfortable. 15th, 100 ma. for 5 minutes. The period was got through without any discomfort or feverishness. 17th, 90 ma. 19th, 110 ma. 21st, 110 ma. 22d, 110 ma. 24th, 100 ma. 26th, 100 ma. 28th, 100 ma. 31st, 100 ma. for 5 minutes each.

January 2d, 1889.—100 ma. 4th, 100 ma. 5th, 100 ma. 7th, 100 ma. 10th, 115 ma. for 5 minutes each. There has been nothing to chronicle, as the patient has been quite well, and has been going to concerts and the theatres, as if there were nothing the matter with her.

June 7th, 1889.—"I am delighted to say I am enjoying very good health, and am equal to any amount of walking, driving, gardening, etc., without the aches and pains which resulted from such exercises last summer. We drive to town twice or three times a week; so 50 or 60 miles in a high dog-cart, that people 'without encumbrance' say wants the house steps to enable them to get up, is a strong testimonial in favor of the electricity that has lightened my load."

Case CIII.—Married, age 34; was brought by Dr. Ransford in November, 1888.

The lady had not been well for ten years, since her younger child was born, but the history of the tumor appeared to date back about half that time. She suffers from very severe pain at the periods, so bad that lately she has required to have morphia injected usually 5 or 6 times. Hemorrhage also is a very prominent symptom, seventy diapers being used as a rule. She feels that something must be done, and that life is scarcely worth living.

On examination the tumor is found to be very prominent, and to extend to within an inch of the umbilicus. The sound passes to a depth of ten inches.

November 3d, 75 ma. 5th, 80 ma. 7th, 65 ma. 24th, 100 ma. for 5 minutes each. The period came on without any pain, but this appeared as the flow was leaving off. Feels very fairly well, however. 26th, 95 ma. 28th, 100 ma. 30th, 75 ma. for 5 minutes each.

December 3d, 50 ma. for 5 minutes. The period is on again accompanied by a great deal of pain. To stop this if possible the application was made to-day at the patient's own house, and the rest of the treatment will be conducted in the same manner. 5th, 70 ma. 7th, 80 ma. 10th, 80 ma. 12th, 100 ma. 14th, 70 ma. 17th, 70 ma. for 5 minutes each. The general condition improves and the tumor is smaller. 19th, 90 ma. 21st, 100 ma. 26th, 70 ma. for 5 minutes each. A small piece of tumor (?) came away yesterday. 28th, 65 ma. for 5 minutes.

January 1st, 1889, 120 ma. for 5 minutes. The loss has not been more than one-quarter of the usual, and morphia was required but three times. 3d, 130 ma. 5th, 130 ma. 7th, 130 ma. 9th, 100 ma. 11th, 150 ma. 14th, 100 ma. 16th, 110 ma. 18th, 115 ma. 23d, 120 ma. for 5 minutes each.

February 6th, 170 ma. 11th, 100 ma. for 5 minutes each. The last period was described as a splendid one, with less flow even than last time. The tumor is about one-third the size of what it was, and for the last few mornings the lady has been able to be down to breakfast by eight o'clock.

Case CIV.—Single, age 33; was brought by Dr. Shaw Mackenzie.

Symptoms of something being wrong began four years ago, though for half of that time they were not very marked. For the last two years, however, she has found that she was

beginning to lead the life of an invalid, and could walk a very short distance. Before she began to get ill the periods lasted for five days; now the flow lasts for eight, and the quantity of blood which is lost is more than double, and the interval of three weeks has been shortened to two. It is seldom that there is pain, but there is often sickness.

The lady looks white and listless, and the lips are very decidedly anæmic.

The tumor fills the pelvis, the cervix is low down, and the sound passes forward, leaving the bulk of the tumor behind.

It will be seen that this lady was never able to bear the passage of a strong current.

November 27th, and 29th, 1888, 50 ma. for 5 minutes.

December 4th, 65 ma. 6th, 70 ma. for 5 minutes each. The patient looks brighter, and says that she feels stronger and can walk better. 8th and 15th, 60 ma. for 5 minutes. The period has been much the same as usual. 17th, 60 ma. 20th, 70 ma. 22d, 70 ma. 27th, 70 ma. 29th, 65 ma. for 5 minutes each.

January 1st, 1889, 60 ma. 3d, 60 ma. 5th, 55 ma. for 5 minutes each. The period is commencing after an interval of three weeks. 10th, 55 ma. for 5 minutes. The quantity of blood has been greater, though the time has been shorter. Feels stronger than usual. 12th, 55 ma. 15th, 60 ma. 17th, 60 ma. 22d, 70 ma. 24th, 50 ma. 26th, 60 ma. 28th, 55 ma. for 5 minutes each.

February 7th, 60 ma. for 5 minutes. The period has been much the same as the last. 9th, 55 ma. 12th, 60 ma. 15th, 60 ma. 17th, 75 ma. 19th, 55 ma. 21st, 50 ma. for 5 minutes each. The tumor is smaller and does not lie so much toward the back. The patient says that she feels much stronger and can walk farther and with much more ease and comfort.

On 6th May the lady wrote, "You said that you would like to know how I got on, also I thought I should like to write and tell you how very much better I am feeling. My face is getting quite a color, and I think you would be satisfied with the progress I have made."

Case CV.—Single, age 29; was sent by Dr. Coleman, of Streatham, in December, 1888.

This young lady had been losing too much blood every month for four years. At first, and for two years, it did not

affect her general health; but for the last two she has been becoming anæmic and breathless. Formerly, menstruation continued for five days; now it lasts for eight, and the loss is much in excess of what used to be natural to her. For a year she had been treated by a well-known gynecologist, with, at first, temporary benefit; but it had become evident that something stronger than medicine and general treatment would be required. After treatment by electricity had been advised, she was taken to see the most eminent specialist in London, who agreed that it was worth trying, at any rate.

The patient was very much blanched, and on examination it was found that the pelvis was entirely filled by a tumor, which projected up into the abdomen; the cervix was within an inch of the vaginal outlet. The sound passed forward for between 4 or 5 inches. For the first two weeks of the treatment the young lady lived in town; during the remainder of the time she went back and forward to her own home in Streatham.

December 11th, 1888, 80 ma. 13th, 100 ma. 15th, 100 ma. 17th, 115 ma. 19th, 100 ma. 21st, 115 ma. 24th, 100 ma. 28th, 105 ma. for 5 minutes each.

January 8th, 1889, 120 ma. for 5 minutes. The first period since the treatment was begun is over; it lasted six days, and the quantity of blood lost was greater than it had ever been. 10th, 130 ma. 12th, 120 ma. 15th, 120 ma. 17th, 125 ma. 22d, 125 ma. 24th, 150 ma. 26th, 160 ma. for 5 minutes each. The patient is beginning to feel a little better and stronger.

February 5th, 140 ma. for 5 minutes. The very worst period she has ever had is over. The flow continued for ten days. 7th, 160 ma. 9th, 150 ma. 12th, 130 ma. 19th, 80 ma. for 5 minutes each. The young lady is improving somewhat rapidly. 21st, 145 ma. 23d, 110 ma. 25th, 120 ma. for 5 minutes each. The color is much better; the tumor is beginning to rise up out of the pelvis.

March 7th, 150 ma. for 5 minutes. The period is just over; there has been less discharge than for the last eight months. The cervix is now far back in the pelvis, with the fundus uteri turned up into the abdomen. 14th, 75 ma. for 5 minutes. After going home on the 7th instant there was a sudden flow of blood, described as being most alarming; the bleeding continued for several days, and was accompanied by pain. 16th,

110 ma. 19th, 115 ma. 21st, 110 ma. 23d, 120 ma. 26th, 120 ma. for 5 minutes each.

April 13th.—Another bad period has been passed through, during which there were several sudden gushes of blood.

May 9th.—"I am pleased to tell you my daughter is steadily improving. The last period was not excessive, and there was none of the sudden rushing at the end. Therefore she is much better than has been usual now it is over."

May 20th.—"I am glad to say my daughter continues to progress."

July 6th.—"It is two years since I had to tell Dr. Coleman how bad I was getting.

"The periods do not last more than three or four days. I am feeling so different from this time last year."

Case CVI.—Single, age 48; was sent by Sir Spencer Wells in December, 1888.

This lady complained of symptoms due to the size of the tumor. For eighteen years she had known of the presence of a growth; but it has given rise to trouble only in the last year or two. She suffered from discomfort; from difficulty in walking and stooping; and also from a painful and full feeling high up in the left side. Arrangements had almost been made for the performance of hysterectomy, when the lady consulted Sir Spencer, who advised the electrical treatment, as there were no urgent symptoms calling for operative interference, especially at the age of 48. The broad ligaments were not opened up by the tumor, and operation would have been easy.

On examination, the tumor was found to be hard, large, and not movable. On the left side its upper margin was masked by the ribs, which were much elevated; on the right, the tumor barely reached up to the costal margin; but it caused very considerable bulging in the side. The sound passed to a depth of 7 inches.

December 19th, 70 ma. 21st, 70 ma. 24th, 90 ma. 26th, 110 ma. for 5 minutes each. The tumor is slightly movable, is smaller on the right side, and the lady thinks that she walks somewhat more easily. 28th and 31st, 100 ma. for 5 minutes. The period is almost due, and the patient is more comfortable than usual.

January 2d, 1889, 100 ma. 8th, 110 ma. for 5 minutes each. The period has been as usual; the patient walks better and is

more comfortable. 10th, 130 ma. 14th, 125 ma. 16th, 110 ma. 18th, 130 ma. 29th, 100 ma. 31st, 110 ma. for 5 minutes each.

February 2d, 160 ma. 4th, 140 ma. for 5 minutes each. The tumor steadily decreases in size. 6th, 140 ma. 8th, 110 ma. 12th, 110 ma. 15th, 110 ma. 23d, 110 ma. 25th, 150 ma. for 5 minutes each. There is a marked difference in the size of the tumor, more especially on the right side. 27th, 135 ma. for 5 minutes.

March 1st, 125 ma. 4th, 120 ma. 6th, 140 ma. 14th, 145 ma. for 5 minutes each. The period came on a week too soon. The tumor does not bulge so much in the flanks, and the depth of the cavity is 5 inches. 16th, 145 ma. 18th, 125 ma. 20th, 120 ma. 22d, 120 ma. 25th, 120 ma. for 5 minutes each. The tumor is movable, and the abdominal wall is not so tightly stretched over it. The lady walks better and feels lighter. 27th, 120 ma. 29th, 115 ma. for 5 minutes each.

April 1st, 115 ma. 3d, 110 ma. for 5 minutes each. 9th, 120 ma. for 8 minutes. 11th, 115 ma. 13th, 125 ma. for 10 minutes each. For some time it has been possible to push the tips of the fingers between the ribs on the left side and what appeared to be the highest point of the tumor. To-day, on pressing deeply, a large mass was found to spring from the upper and back part of the tumor, and to extend deeply, up under the posterior half of the diaphragm. The tumor was thus larger than had been supposed, and the discomfort and feeling of fulness, originally complained of high up on the left side, were thus accounted for.

Called in July to say that she continued to improve and that her friends found her much better. The tumor was decidedly smaller than when last seen.

ETHER-DRINKING;

ITS PREVALENCE AND RESULTS.

BY

ERNEST HART,

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ETHER-DRINKING;

ITS PREVALENCE AND RESULTS.

HISTORY — GEOGRAPHICAL DISTRIBUTION — DETAILS OF THE TRADE — METHODS OF DRINKING, DOSE, ETC. — EFFECTS, IMMEDIATE AND REMOTE — REMEDIES.

THE allegation of the use of ether as an intoxicant in Ireland is not a new one, but the references which have from time to time been made to the existence of such practice have been received with a good deal of indifference, if not incredulity. Moreover, the practice, so far as it has existed, was said to have largely died out. Lately, however, some very circumstantial statements which have appeared in the English and Irish press excited my interest so much that I determined to supplement some little personal knowledge which I had acquired of the facts on previous occasions by a detailed investigation conducted with a view to obtain all the available information as to the prevalence of the practice, its origin, localities, sources of supply, and the observed results. For this purpose, I applied for information directly to those in the best position to know all the facts accurately, that is to say, to the doctors and priests of the incriminated districts. Subsequently, I drew up a schedule of questions relating to the time at which ether-drinking came into fashion, as to the prevalence of the habit, as to the quantities taken, and its effects on the health, both of body and mind, and on the duration of life, which I placed in the hands of persons likely to have personal knowledge. Detailed replies to the questions have been received from twelve doctors, four Roman Catholic priests, and one clergyman of the Church of Ireland. I have also been able to obtain information from other sources of the places of supply and manufacture. To all these gentlemen

I take this opportunity of expressing my thanks for their courtesy. The results of the inquiry are embodied in the present paper.

History.—There is some difference of testimony, or rather of opinion, as to the date of the origin of ether-drinking, and as to the causes which led to its introduction. The most generally-received belief is that it came into use after Father Mathew's preaching had banished whiskey from a considerable part of the north of Ireland. The "new drink" is supposed to have been introduced as a beverage which might be taken without "breaking the pledge"—in fact, as a liquor on which a man might get drunk with a clear conscience. Mr. H. N. Draper ("Medical Press and Circular," May 30th, 1877) says ether-drinking was first practised at Draperstown, County Derry, about 1842, while ether was sold for the first time at Maghera between 1845 and 1850, and the practice became very common there five or six years after its introduction, reaching its climax about 1869. Dr. B. W. Richardson says ether was introduced into Draperstown about 1846 or 1847, and for thirteen years at least it was sold freely. Dr. Walter Bernard, of Londonderry, whose personal experience extends over forty-two years, informs me that during all that time he has known ether-drinking to be practised; he considers its introduction to have been an indirect effect of the success of the teetotal movement. On the other hand, Dr. James L. Nevin, of Ballymoney, writes to me that "it is rather puzzling to get at the origin of its use, but I do not believe in the 'Father Mathew teetotal movement' cause. My own opinion is," he says, "that in a country whose people in the past have been notoriously addicted to illicit distilling, the impossibility of indulging in it now, owing to the present Inland Revenue watchfulness, has driven the people to ether as the best substitute for poteen."

In a further communication, Dr. Nevin adds: "Before the new excise arrangements and the increase of constabulary, that part of County Derry was notorious for illicit distillation." A medical practitioner, near Cookstown, to whom I am specially indebted for the fulness of his replies to my questions, but whose name I am not at liberty to disclose, says that he has known of the prevalence of the habit in that place for twenty years or more; "in fact," he writes, "the odor of ether on folks' breath is a very early recollection indeed. . . . The habit

must have been in full swing in this district (including that of Moneymore and Draperstown) about 1870–72. How long it may have been in vogue before then I personally cannot say, but have been told it had been common many years before that period." He adds: "I have been told that some of the other medical men here and in the neighboring towns (Moneymore, Magherafelt, Draperstown, etc.) were strong believers in its efficacy as a medicine and stimulant, and that they even sold it in draughts over the counter on fair days, etc., to any one coming in to ask for it. Then I believe small country grocers and publicans bought quantities of it from these medical men, and at a later date from the pharmaceutical chemists and town publicans, and retailed it to the country people throughout the district."

Another of my correspondents attributes the origin of ether-drinking to its cheapness, adding that "the people living in the mountainous districts here are fond of white whiskey owing to its great warmth; and ether being the same color, they often get it perhaps when white whiskey would be out of stock." The Rev. Peter O'Kane, P.P. of Knockloughrin, County Derry, states that ether-drinking first came under his notice in 1865. He adds: "It was given by the doctors as medicine, and some of them sold it to the people in general. Then the public-houses sold it."

The Rev. Edward Gallen, C.C. of Granahan and Maghera, County Derry, who first heard of ether-drinking when appointed curate at Draperstown in 1871, gives me the following account of the origin of the practice: "About eight or ten years previous to 1871 a drug shop in Draperstown, belonging to a proprietor having little to do in the ordinary way, gave 'draughts' of ether as a stimulant cheaper than whiskey to healthy people. The evil soon spread." As we have seen, however, the habit was fully established many years before that time. Dr. F. Auterson, of Magherafelt, who has known of the existence of ether-drinking since 1853, gives the following account of its origin: "A few years prior to the above date an unqualified medical man named Kelly practised at Draperstown and kept a drug store. He drank more whiskey than was good for him; he was prevailed on to give up the whiskey, and then used the ether, and taught the people to use it also." This narrative seems to bear the stamp of intrinsic probability,

and it may commend itself to historical critics as combining in itself the two theories above mentioned as to the origin of ether-drinking. As regards the history of the practice, therefore, it may be taken as proved that it began something less than half a century ago at Draperstown, in South Derry, that town being, in the words of one of my informants, the Rev. Edward Gallen, "the centre point and spring of ether-drinking." From Draperstown the habit spread over certain parts of the county of Londonderry, the borders of the neighboring counties of Antrim and Tyrone being also infected to a certain extent.

I cannot doubt, however, from the evidence before me that great impetus was given to the use of ether as a beverage by the Act 18 and 19 Vict., c. 37, passed in 1855–56, which had the object of allowing spirit of wine to be used duty free in the arts and manufactures, and for this purpose provided that such spirit should be rendered unfit for use as a beverage by the addition of not less than one-ninth of its bulk of wood naphtha—a mixture termed methylated spirit. I find in the "Pharmaceutical Journal" of that year that Mr. MacFarlane, of Edinburgh, states that both chloroform and ether could be produced from methylated spirit in a state of great purity. The chloroform was entirely free from any flavor derived from the naphtha, and the ether he thought was as good as much that is made in the usual way from spirit of wine. This was confirmed by Mr. Redwood. The "methylated ether," then, which we hear of as being sold as a beverage is altogether a different thing in point of flavor and odor from the nauseous methylated product known as methylated spirit. It is an ether prepared from methylated spirit, but in which nearly all the methyl products have been removed by purifying processes. I have here, however, the pure ether prepared from rectified spirit, and two grades of "methylated ether"—that is, ether prepared from methylated spirit. The difference is not very marked to the ordinary observer, except in price. The pure ether costs wholesale about 5s. a pound, the methylated ethers respectively 1s. 4d. and 8d. a pound; so that the price of one is about seven times the price of the other. It is to the introduction of this cheap ether, which can be retailed at a nominal price, and to the simultaneous activity in hunting down the illicit stills, that the prevalence of ether-drinking

may, I believe, be traced; and I believe that Father Mathew's name and the alleged indirect influence of "taking the pledge" against alcohol have been drawn into the history with more picturesqueness than historical accuracy.

Geographical Distribution.—The point of greatest prevalence of ether-drinking is the southern part of the county of Londonderry; in the northern division of the county it appears to be practically unknown. Thus a well-known practitioner of Coleraine writes to me: "In an experience extending over the last seventeen years I have not met with a single case. . . . I only knew of ether-drinking during my apprenticeship, about 1866 or 1867. It was then mainly confined to that portion of South Derry about Draperstown and Maghera. Since then I understand the practice of drinking ether has extended to other districts around there, such as Bellaghy, Magherafelt, and the mountainous portion of the Moneymore district." Dr. H. S. Morrison, of Coleraine, also writes: "The habit is practically unknown in my district. Although some time ago a grocer in this neighborhood had it for sale, no one, so far as I can find out, except a very few patronized him. They were so few in number in this part of the country that keeping it did not pay, and it is now a thing of the past." Dr. Caldwell, of Coleraine, writes: "I never knew a single case of ether-drinking in this district, neither in my capacity as coroner, although my division is within three miles of Maghera." Dr. T. M. Bryson, J.P., of Limavady, another coroner, says: "Ether-drinking is not known, nor has it ever been practised in this part of County Derry." Dr. J. W. Watson, of Limavady, writes: "The practice has not extended to this portion of North Derry." All the testimony I have received goes, therefore, to show that the chief centres of ether-drinking are Draperstown, Maghera, Magherafelt, Tobermore, Desertmartin, and Moneymore in County Derry, and Cookstown in County Tyrone. The habit is also prevalent, though to a less extent, in a district of South Derry, included by a line drawn from Ballyronan through the villages of Castledawson, Knockloughrin, Gulladarf, and Clandy to Portglenone, and bounded on the other side by Lough Neagh, Lough Beg, and the Bann. With regard to Cookstown I may quote the words of Dr. M. J. Cordier Marmion, J.P., of Dungannon: "About three years ago I was practising in a small town named Pomeroy, about eight miles

from Cookstown. The district for about five square miles is very mountainous and thickly populated with a poor class of farmers. There was scarcely a house in the various districts around but ether was largely indulged in." He adds. "I am at present practising at Dungannon, and although my practice extends over a large area, with very few exceptions I have not found ether indulged in." With reference to Dungannon, again, the Rev. P. J. Byrne writes: "As ether-drinking is quite unknown in this parish or district, I return your queries unsigned. I believe the practice does exist about ten miles distant from this." I may add that, from private information which I have obtained from a trustworthy source, a good deal of ether is sent from Belfast to Dungannon and Omagh; not much of it, however, seems to be consumed in these towns, which are rather local centres of distribution to other places.

Details of the Trade.—The fluid used is, as I have said, the ordinary methylated ether of commerce. I have taken some trouble to ascertain whence and in what quantities it is supplied to the ether-drinking districts, and although the dealers are not communicative and the difficulty of the inquiry was increased by the fact that an excise officer and an official of the Inland Revenue Board had in nearly all cases recently gone over the ground before me and thus put people on their guard, I have collected a mass of important information from which pretty accurate inferences can be drawn as to the amount of the intoxicant that is consumed in the north of Ireland. I have been assisted in the investigation by gentlemen whose names would be sufficient guarantees of their competence as witnesses in this matter, but I regret that I am not at liberty to mention them. It is obvious also that I cannot publicly mention the firms engaged in this traffic, but I have no objection to furnish information on this head privately to any authorities interested in the subject. It would certainly be desirable that the heads of these firms should be examined before the select committee. No ether appears to be manufactured in the north of Ireland, and one gentleman, with exceptional means of knowing, assures me that none is made in any part of Ireland. Mr. H. N. Draper, however, in one of the articles already referred to, asserts that one Dublin manufacturer sent 4,000 gallons yearly to Belfast, and the name of a firm who now make it in the same city has been supplied to

me. The great bulk of the ether consumed in Ireland is, however, undoubtedly sent there from England. One firm in London supply about 150 Winchester quarts (half-gallon stoppered bottles) yearly to one druggist in Belfast. Another London firm send 50 "drums" (metal vessels, each containing about 10 gallons) a year to the north of Ireland; this is not nearly so much as they used to send fifteen years ago. The books of a very important firm near London, I am told, show extensive sales of methylated ether. The names of large Irish buyers are especially noticeable, and markedly influence the consumption. The amount sold was largest in 1876 and fell off more than one-third in a few years; latterly, however, it has again increased, so that in 1889 it was only about one-tenth less than in 1876. This firm, to its credit be it said, called the attention of the excise years ago to the consumption of methylated ether in Ireland, but little heed was taken of the communication. Another firm near London sends methylated ether to Belfast both in "drums" and in Winchester quarts, but their trade in the article has fallen off rather than increased of late years—"the excise looked after them too well," as the head of the firm said rather sorrowfully. Another London firm stated that their sales of methylated ether for drinking had diminished of late, though their actual sales had increased. There is also a firm at Newcastle, or rather Gateshead, which is known to send large quantities of ether to Ireland. A representative of a large Edinburgh firm stated that they do not make much methylated ether, and what they do supply is chiefly for anæsthetic purposes. They cannot compete with the price of the London makers. This gentleman added that very little ether is made in Edinburgh or Leith by other makers. These seven firms appear to comprise all the important manufacturers of ether in this country. The trade is chiefly in the hands of three of them, of which two are said to be "above reproach," though not, it would seem, *sans peur*, if one may judge from their dread of publicity in connection with this particular branch of their trade.

The result of these inquiries is to show that beyond all question a quantity of common methylated ether is sent from England, and particularly from London, or rather its eastern suburbs, very much larger than is consumed in England in proportion to the population. Of course, it cannot be con-

cluded that all the large supply sent to Ireland is used as an intoxicant. There are many other legitimate medicinal and industrial purposes for which it may be employed. When purified, it is now largely used as an anæsthetic, and it is used therapeutically as a diffusible stimulant, a carminative, etc. In pharmacy it is used for collodion, for making salicylic corn solvents, etc. It is also used in ice-making, and for purposes of refrigeration in various ways, especially in the large breweries; and it is employed largely to abstract fats and oils from various substances, even from fish manure. For all these purposes I am assured the use of ether has very much increased in recent years. Again, it is used in photography. Still, when liberal allowance has been made for all these possible legitimate uses of methylated ether, the consumption of that substance in the north of Ireland, and particularly in the districts which have already been specially referred to, shows a large balance which can only be accounted for by its extensive use as an intoxicating drink.

A large part of the ether exported to Ireland is sent to Belfast, whence it is distributed to Draperstown, Maghera, Cookstown, Pomeroy, Omagh, and Dungannon. A most trustworthy informant assures me that the amount of ether supplied to all the rest of Ulster is a mere nothing compared with that supplied to these towns. One large dealer states that, roughly speaking, he distributes about 2 cwt. of methylated ether each month—that is, over 1 ton in the year. He says this amount is scattered through Ulster moderately evenly; he allows that a fairly large proportion goes to South Derry and Tyrone, but not in such quantities as to lead him to believe that it is used for drinking. He adds that, from his experience, the practice of ether-drinking is dying out. This gentleman, however, answered without reference to his books, and evidence from other quarters throws doubt upon his inferences. From another Belfast firm it was elicited that they sold to one retail dealer at Maghera from 10 to 15 gallons, and to one at Draperstown from 5 to 8 gallons, a month. Larger amounts are sent to Cookstown. Omagh was said by Mr. H. N. Draper in 1870 to take 450 Winchester quarts (equal to 225 gallons) yearly. Another Belfast dealer says he sells from 25 to 30 cwt. of methylated ether in the year, and the great bulk of it goes to the towns already mentioned in South Derry

and Tyrone. From another wholesale dealer, who is not by any means the largest dealer in Belfast, specially interesting information was obtained. He buys 7,124 lbs. of methylated ether in the year; this is calculated on an average of six months as verified by his books. This amount is distributed over the whole of the northern half of Ireland, but not less than 5,074 lbs. go to the comparatively small ether-drinking district. The difference between these two amounts would represent the legitimate medicinal consumption, all the rest going to the few small towns so often mentioned. In Londonderry, as Dr. Walter Bernard informs me, the druggists used, fifteen or sixteen years ago, to supply large quantities of ether to the ether-drinking districts. This trade, however, they have now, according to him, given up. It should be added that, as regards population, the ether-drinking district compared with the area supplied contains a mere handful of inhabitants. All the evidence which I have collected tends to prove that the amount of ether sent to that district from Belfast is out of all proportion to that supplied to the remainder of the north of Ireland. An informant, who has special opportunities of knowing the facts, however, tells me that from what he has seen, the bulk of the ether consumed in South Derry and Tyrone comes direct from the English makers. One man at Cookstown habitually purchases fifty gallons and upward at a time direct from the makers. I have the names of several of the ether buyers in Cookstown, Draperstown, and Maghera, but for various reasons suppress them here. The ether brought from England is conveyed by three companies; that is, if the information given me is correct, only three companies will carry the "drums" which are known to contain ether. These are the Clyde Shipping Company (from London to Belfast direct); the Carron Carrying Company (from London to Belfast, via Leith); and the Antrim Ore Company, also via Leith. The Leith route perhaps accounts for the statement made by some of my informants who say that ether is sent to Ireland from Glasgow. The rate charged by the Clyde Shipping Company for ether to Belfast, including collection here, is 84s. 2d. a ton. Much of the ether which finds its way to Ireland, however, is smuggled, in order to avoid the extra carriage rate to which ether, as an explosive which must be carried on deck, would be subject. It is rebottled out of the

"drums" into Winchester quarts and, under cover of this device, goes as "drugs."

The customers in the towns of the ether-drinking districts, who buy the drug in considerable quantities, either from the English makers or from the Belfast importers, are grocers, who are also in many cases in these sparsely-populated places druggists and general dealers. They retail the methylated ether over the counter, and in some instances supply it to still smaller dealers in the villages. This is proved by the fact that some of them, when getting their supply from Belfast, insist on an exact and uniform weight being put into each bottle, showing that they sell these bottles (each containing half a gallon) unopened. The price at which the three principal English manufacturers supply methylated ether is 8¼d. per pound in quarts, or 8d. in "drums." Considering the light specific gravity of the liquid, this means very much less than ½d. an ounce. It will be seen from this that no other intoxicating drink can compare with methylated ether as regards cheapness. Its retail price is about 1d. per two drachms, or even ½d. for a drachm and a half. It is possible, therefore, to get rapidly intoxicated for a very few pence. The retail dealers, however, often dilute the ether which they receive from the makers to a considerable extent, and thus, according to the Rev. Dr. Carter, rector of Cookstown, clear a profit of cent per cent. Dr. Carter also says: "In small poor grocery shops ether is sold without restriction. It is hawked about by beggar-women and sold to the peasantry for eggs and farm produce." I am afraid I must add that it is occasionally sold over the counter by medical men, who keep "open surgeries." A practitioner at Limavady, where, as has been seen, ether-drinking is comparatively rare, informs me that his assistant is occasionally asked for a "draught of ether," and he has had to give instructions that the drug is not to be sold under any circumstances unless the purchaser is known and it is required for medicinal use. Another correspondent writes: "More than twenty years ago I served my apprenticeship in a 'medical hall' in a town in South Derry, and even then I frequently sold on market days what was called a 'dram' of ether, which consisted of 1½ drachms of good sulphuric ether, for which ½d. was charged." Another practitioner, writing from Cookstown, says: "The small retail country grocers seem to obtain un-

limited supplies of it and to find a very ready sale for it here. I have also been told (this I will not personally vouch for) that both it and methylated spirit of wine can be obtained in the surgeries of some medical men in the district, the people coming in, ordering it, paying for it, and drinking it there, just as they would do whiskeys, beer, etc., in a public-house." This, however, is a painful subject, and I content myself with this passing allusion to it here, as it involves an imputation which I trust is very seldom deserved.

Method of Drinking, Dose, etc.—Mr. H. N. Draper (*loc. cit.*) says: "The usual quantity of ether taken at one time is from 2 to 4 drachms, and this dose is repeated twice, thrice, or even four and six times daily. It is taken unmixed with water; indeed, its very slight solubility in that fluid would make this a useless precaution; but the usual practice is to take first a mouthful of water, then the dose of ether, and again a mouthful of water." Dr. Richardson describes the process as slightly more elaborate. According to him, "the drinker first washes out his mouth with water 'to cool it;' next he swallows a little water to cool his throat; then he tosses down the glass of ether; finally, he closes in with another draught of water to keep the ether from rising, or, in other words, to cool the stomach.". The ritual of ether-drinking is, however, not always the same. Dr. C. H. P. D. Graves, of Cookstown, informs me: "It is always the methylated spirit that is drunk, the usual quantity being about 2 drachms in water, but an experienced drinker can, by holding his nose, consume a large quantity undiluted." Another Cookstown doctor informs me that the ether "is commonly sold in 'draughts'—that is, quantities rather less than half a spirit-glassful. This is generally drunk neat at one gulp, and followed by a mouthful of water in the case of the novice, but the *habitué* scorns the water. This dose is repeated in varying frequency, according to the desire or habit of the individual. I have known about six or seven 'draughts' to be taken by one person in about an hour, but have often heard wonderful tales of some who consider about a pint not an extraordinary allowance for one individual during an ether debauch." With regard to the amount sufficient to produce intoxication, the same gentleman says: "The dose varies much according to constitution, age, and addiction to the habit. I have heard

some boast that they could drink a dozen to twenty draughts in an evening, but a quarter of this amount would more than intoxicate an adult unused to the drug. In fact, one draught —less than half a wineglass—will produce ether intoxication in any one unaccustomed to it."

On the other hand, Dr. Hetherington, of the District Lunatic Asylum, Londonderry, says: "Two drachms is usually taken, which costs about 1d., and three or four of these intoxicate, but old hands can take much larger quantities." Dr. Nevin, of Ballymoney, says that as much as ten ounces may be habitually taken in the course of the day; he has heard of several ounces being taken at one dose. Dr. J. W. Watson, of Limavady, has heard men boast that they could drink a "noggin" (equal to five ounces) at a draught, but has never seen this feat actually performed. The largest quantity he has seen a man drink has been one ounce. These statements show that, as might *a priori* have been expected, the quantity of ether that can be drunk with impunity and the dose sufficient to produce intoxication vary, just as in the case of alcoholic stimulants and drugs of all kinds, according to individual idiosyncrasy, induced tolerance, physical condition, etc. The special danger of ether as compared with other intoxicants lies in the fact that, as the immediate effect passes off very quickly and leaves behind little or no discomfort in the shape of nausea, headache, dry mouth, etc., what Dr. Norman Kerr calls the "drama" of intoxication can be repeated several times in the day. As Dr. Graves, of Cookstown, says, "An ether drinker will get drunk half a dozen times a day." This, of course, is considered one of the chief advantages of ether by its victims and votaries.

Prevalence of the Evil.—Some idea of the magnitude of the consumption of methylated ether in South Derry and Tyrone may be gathered from the details that have been given as to the quantities supplied by certain large firms. There can be little doubt, however, that the actual trade is far larger than these figures would indicate. The whole business, however, is so shrouded in "decent obscurity" by most of those who have an interest in the traffic that it is at present impossible to obtain anything like trustworthy statistics on the subject. One can only judge of the extent to which the habit prevails from the statements made by competent observers,

who speak from personal knowledge. Thus the Rev. Dr. Carter, rector of Cookstown, has publicly stated that "more than two tons of ether are openly passed along the railways each year into this district, while a larger quantity is conveyed secretly by rail or by private conveyances into the localities mentioned. . . . In two small villages I know of two traders who sell over 500 gallons each annually. . . . The habit grips whole families, and becomes hereditary and spreads with rapidity. Since I began my inquiries and called attention to the subject it has seized a new district." Again, the same authority says: "It is given by traders to school children and messengers, and in some towns and localities causes on Sundays the largest part of intoxication." In a letter to me, Dr. Carter says, with reference to these statements (which were made in the Dublin "Daily Express"): "On every item mentioned I have abundant proof from most reliable authorities." All my correspondents who are able to speak from personal experience have confirmed the statements made as to the prevalence of ether-drinking at Cookstown, Draperstown, Maghera, and the other towns so often mentioned. Dr. C. H. P. D. Graves, of Cookstown, writes: "Being medical dispensary officer of the Cookstown District, I am brought into close contact with all classes. I find ether-drinking more prevalent among the very poor than among the well-to-do, I suppose on account of cheapness; but even if a person who is comfortably off begins drinking ether, he is sure to reduce himself to poverty, the habit being as pernicious as opium-eating. . . . On Saturday evenings (market day) the atmosphere along the roads is simply impregnated with the fumes of ether, so many of the market people drink it." Another informant, speaking of South Derry, says that the doctor to whom he was apprenticed some twenty years ago told him that "the practice of drinking ether in the district prevailed to such an extent that there were scattered over the country what was known as ether-houses, where a cheap and impure article was sold." My correspondent goes on to say: "From information received from a reliable source, I believe the practice of drinking ether has grown considerably since then." Another correspondent, speaking of the districts surrounding Cookstown, Moneymore, and Draperstown, says: "Its odor is often to be felt in people's breath, and even the very atmosphere is loaded

with it in some places, and especially about fair times. Its odor seems to cling to the very hedges and houses for some time." Dr. Cordier Marmion, J.P., writing from Dungannon, says: "The coroner for this division of the county held an inquest some few months ago in or about Pomeroy, where a person's death was caused by an overdose of ether. He commented strongly in his address to the jury on the frightful absue of ether-drinking in this part of the North." A practitioner at Cookstown writes: "I have noticed its odor in the breath of hundreds of people. I know and have known perhaps well on to a hundred people who take it pretty freely. . . . You would be surprised to know how many comparatively respectable people take it, and do not seem at all ashamed to do so. Of course, these generally say they take it for 'wind in the stomach,' 'pain in the head,' 'giddiness,' etc., using it as a domestic medicine, and often keeping a considerable supply in their homes. It is often drunk to intoxication at wakes and dances, especially in the more backward and mountainous districts." Dr. Hetherington, of the Londonderry District Lunatic Asylum, writes: "Its use was kept in check for some time, but is now largely on the increase. . . . It is drunk by both sexes, young and old; not so much, however, as yet among young girls. . . . It appears to take a great hold on the people." One of the guards of the Derry Central Railway from Coleraine through the ether-drinking districts informed Dr. Walter Bernard that the smell of ether in the third-class carriages on market days from the women coming from Maghera is "disgusting and abominable," and the odor is even worse on the last Tuesday of each month, the fair day at Maghera. Dr. Bernard also tells me that, for the last two years, ether-drinking has been greatly on the increase in the southern portion of the county of Londonderry "among all denominations belonging especially to the small farming and laboring classes."

On the other hand, the few priests who have favored me with replies show a tendency (perhaps not altogether unnatural) to minimize the extent of the evil. Father B. Nugent, of Cookstown, says: "Ether-drinking in this parish is a reserved sin for Catholics for the past seven years. It is not sold by them, nor used to my knowledge except by the advice of a physician in case of sickness." Father Edward Gallen, C.C. of

Granahan and Maghera, writes: "Ether-drinking has almost died out in my particular neighborhood. About fifteen years ago a man fell dead on the street of Draperstown from ether. The Catholic clergy immediately after denounced both the selling of it in the little shops and the drinking of it. It died away to a considerable extent for many years. It revived much a few years ago. Our attention reverted to the suppression of it anew. In this parish I publicly from the altar banned it a year ago. Both sellers and drinkers obeyed my proclamation. There is no drinking of it here now. I believe the same is true of other parishes near me." But how are we to reconcile this opinion with the circumstantial evidence to the contrary from other quarters? It is a remarkable coincidence that a similar statement about Maghera (which seems always to have enjoyed a "bad eminence" in respect of ether-drinking) is quoted by Mr. Draper, writing in 1877. He says ("Med. Press and Circular," May 30th, 1877): "In the same town [Maghera] and in the adjoining parishes the use of ether is dying out, owing to the fact that it has been, as the people say, 'cursed' by the parish priest, and it is said that now 'no Catholic dare sell it.'" Probably this was the time of the first conversion alluded to by Father Gallen, and from these repeated relapses it may be gathered how firmly the habit has taken root in that district.

It is a curious fact, if it be true as alleged, that ether-drinking flourishes chiefly among Roman Catholics, the Protestant communities being comparatively free from that particular vice. Dr. Morrison, of Coleraine, says: "I think it very questionable if, with the exception of an isolated case, Protestants are at all addicted to the habit." With regard to Ireland especially, one has always to be on one's guard against being misled by statements colored or distorted by *odium theologicum*, but the assertion here referred to comes to me from so many quarters that it is almost impossible to suppose that there is not at least some sort of foundation for it. In contrast, however, with this statement that there is no ether-drinking among Protestants are the information and reports which led the General Synod of the Church of Ireland some time ago to forward a petition to Parliament praying for the regulation of the ether traffic. The synods of the dioceses of Armagh and Derry also adopted similar resolutions on the

urgent representations of clergymen and magistrates of the counties referred to.

Effects, Immediate and Remote.—The immediate effects of drinking ether are similar to those produced by alcohol, but everything takes place more rapidly; the stages of excitement, mental confusion, loss of muscular control, and loss of consciousness follow each other so quickly that they cannot be clearly separated from each other. It is only the "immoderate" ether drinkers who drink themselves into stupor; many are content not to go beyond the stage of exhilaration, when they become very talkative and laugh hysterically. The effect wears off almost as speedily as it comes on. What De Quincey said of the terrible attractions of alcohol is still more true of ether. The endeavor to renew the state of exaltation induced by the first dose drives the drinker to take more and more of the stimulant, till it becomes a tyrannical abuse, leading to effects precisely opposite to those first arrived at.

That ether is frequently drunk to the extent of inducing intoxication all my witnesses are agreed. Thus the Cookstown authority whom I have so freely quoted says: "It is often drunk to intoxication at wakes and dances, especially in the more backward and mountainous districts. Its effects are very rapidly produced and the stage of excitement very marked. Those under its influence will shout, dance, laugh, and act like maniacs, and, if the dose has been heavy, may fall down writhing and foaming at the mouth. They recover generally soon, and feel low, weak, and depressed, and often then will renew the dose, for which they have generally a strong craving. A smaller dose produces exhilaration and a peculiar feeling of lightness, the person imagining he or she could jump up and fly."

The same close observer thus describes the symptoms often produced by ether-drinking: "Profuse salivation often follows the drinking of ether, and then usually rather violent eructations; the face becomes flushed, and may become livid if large quantities are taken; afterward pallor, weakness, and burning pain at the epigastrium are generally present. Frenzy, maniacal excitement, and ultimately stupor supervene when the dose is large and taken within a short space of time."

Dr. J. W. Watson writes: "It is usually drunk for the pur-

pose of producing intoxication, people drinking it and 'treating' each other as they do with whiskey in other parts of Ireland, or beer in England. The intoxication comes on quickly and passes off quickly. All ether drinkers agree that it is a pleasurable form of intoxication, and others can see that it is a very violent form of intoxication. However, the most violent condition is produced when whiskey and ether are both taken." Dr. Watson and others say that ether drinkers are very quarrelsome in their cups, the intoxication being decidedly of the "fighting" type.

With regard to the more remote effects of ether there is not much to be said. Very little appears to be known by pathologists of any injurious effect it may have on the tissues. Dr. Richardson himself is fain to confess with some regret that there is not much to be said against ether-drinking from this point of view. There are no gross lesions like the shrinking and induration of brain and liver characteristic of alcohol; ether is a thief that steals away the brains without leaving any visible mark of his presence. I have made special inquiries as to its effect on the health, and so far as "moderate" drinkers are concerned, there does not seem to be any evidence that the habit produces anything worse than chronic gastritis and dyspepsia. With regard to the worst cases, however, a careful observer writes: "In ether drinkers who have long followed the habit I have seen general debility, great nervous prostration accompanied by tremors (muscles of neck and forearm mainly affected), indigestion, irregular action of heart, subacute gastritis, a peculiar white-sallow complexion, and in some cases (personally observed) a peculiar livid cyanotic face."

Dr. Walter Bernard notes the following among the injurious effects on health which ether-drinking gives rise to: "Absence of subcutaneous fat, muscular wasting, feeble circulation, pale lemon and brown colored skin, reflexes exaggerated, especially knee-jerks." One terrible effect of ether-drinking is the profound degeneration of the moral character which it often induces; the victims fall into a kind of chronic hysterical condition, lose all self-respect, and, as in the case of nearly all who abuse narcotics, will lie and even steal to procure their favorite stimulant.

Touching the tendency of ether-drinking to produce insanity, my informants are divided in opinion. Dr. Hetherington, of the Londonderry District Asylum, writes: "I cannot connect cases of insanity directly with its use, though many of my patients have been addicted to the habit. The districts named have always had a large proportion of insane irrespective of ether-drinking." Dr. Walter Bernard, visiting and consulting physician to the same asylum, thinks that ether, while not *per se* a cause of insanity, calls into action any dormant tendency to insanity that may exist. My Cookstown authority has himself attended cases in which he considered "the insanity certainly to some extent dependent, both as an exciting and a predisposing cause, on the ether habit." Other correspondents deny that there is any connection, other than accidental, between ether-drinking and madness. The habit seems to lead to crime only through the violence and pugnacity which have already been alluded to as characteristic features of the first stage of ether intoxication.

With regard to the effect of ether-drinking on the duration of life, very little positive evidence is forthcoming. Dr. Walter Bernard says it tends to shorten life by interfering with nutrition and damaging the glandular system. Apart from this, it is obvious that the ether drinker is a "bad life" from the insurance point of view, as he is exposed to many risks from which other people are free. He may at any time kill himself with an overdose of his favorite drug. There have, I believe, been several sudden deaths in the ether-drinking districts which have been attributed to this cause, and inquests have been held on them. I have tried to obtain details of one or two such cases, but have not been successful. The sudden deaths alluded to by more than one of my clerical correspondents, and utilized by them in the pulpit, were probably due to heart disease. One peculiar danger to which it is alleged that ether drinkers are exposed is that of setting themselves on fire in lighting a pipe, etc. Several cases of this kind, all bearing a somewhat suspicious family likeness to each other, are related by my correspondents, but the fact seems well authenticated, at least in some instances.

I have tried to put the results of my inquiry fairly and dispassionately before you. I have let my witnesses as far as

possible speak for themselves, and the paper I have had the honor of reading before you is founded entirely on the evidence with which they have supplied me. It is the testimony of men living in daily contact with the things they describe, and it points to the existence of a very serious evil among a people otherwise exceptionally well conducted. If the physical effects of the habit seem comparatively unimportant, it must be remembered that the subject has never, so far as I know, been really investigated by pathologists armed with all the resources of modern science. Moreover, it must not be forgotten that the majority of ether drinkers are robust country people, living under very healthy conditions. The effects of the habit will no doubt be better seen in their descendants, if the evil is allowed to continue. At present, as has been shown, it is confined within relatively narrow limits, but what guarantee is there against its spreading over the length and breadth of Ireland and clouding the spirit and sapping the physique of the "finest peasantry in the world?" Nay, what security is there against the importation of the vice into this country and the hastening thereby of that decay which, as those uncomfortable persons—the political philosophers—are always telling us, must speedily overtake us? Already, as I am told on the authority of one of the largest manufacturers of ether in this country, ether-drinking is practised in Lincolnshire, and I have not the least doubt that the practice must be frequent enough in London. Many isolated instances have been casually reported to me, and possibly more may now come to light. I know personally of two cases, in one of which it led to a fatal termination.

The sale of ether as an intoxicant must be "stamped out" by the law, but how is this to be done? I am not here to answer that question; I can only say that some obvious remedies lie near at hand. The difficulty is to restrict the sale of ether as an intoxicant without interfering with its legitimate use as a surgical anæsthetic or for various manufacturing purposes. It has been suggested that the sale of it should be confined to qualified pharmaceutical chemists, or that retailers should be required to take out a license. As most of those who indulge in ether-drinking buy it in "draughts" at a time, I would suggest that the sale of it in smaller quantities than,

say, a gallon should be made an offence punishable by a graduated system of fines, the amount increasing with the frequency of conviction. This would strike at the root of the traffic in ether as a cheap intoxicant, and would go far to put an end to the evil. It is earnestly to be hoped that the legislature may at last be roused into taking some action in the matter, and that a remedy may be found for an evil of the existence of which few people are aware.

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